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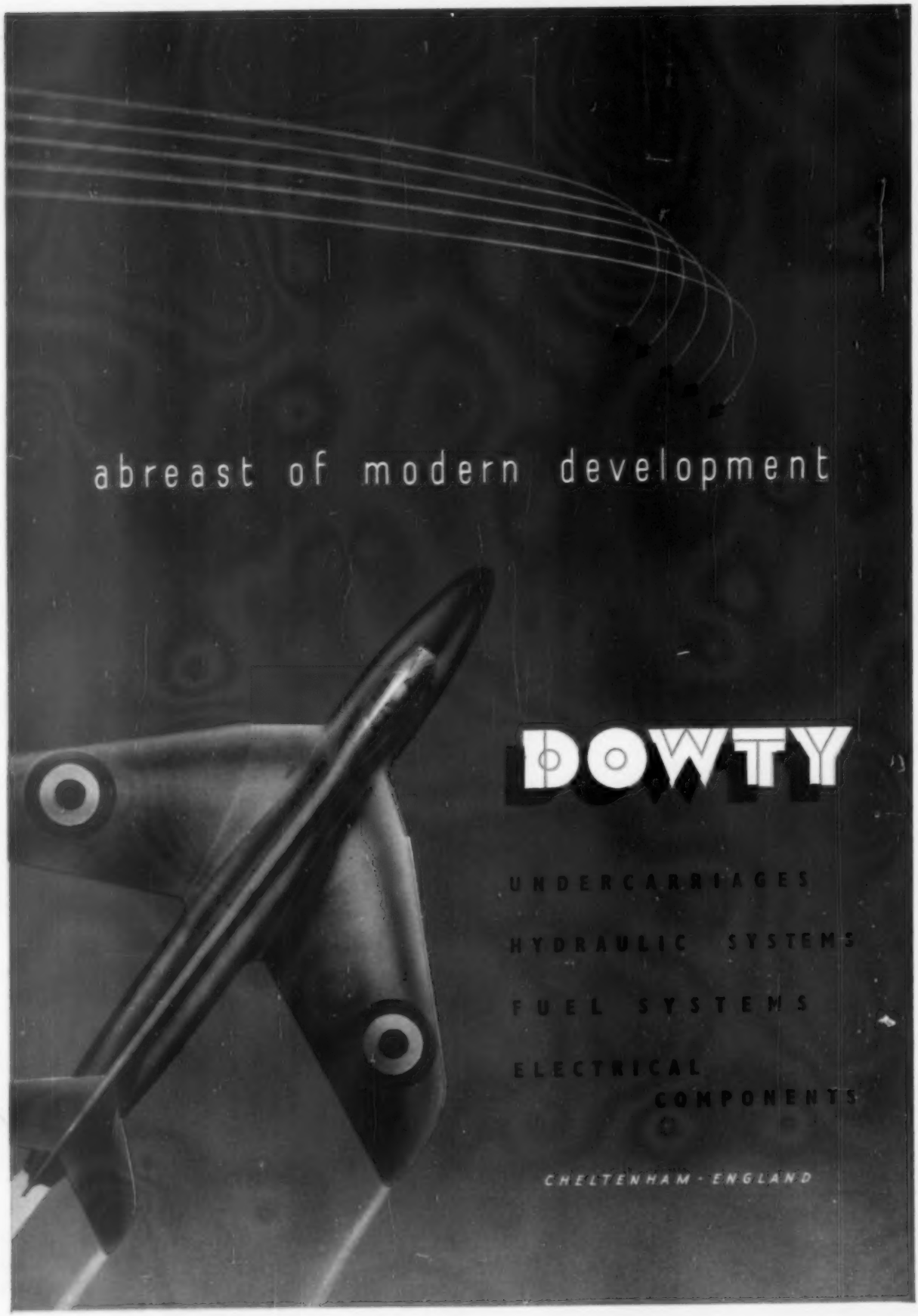
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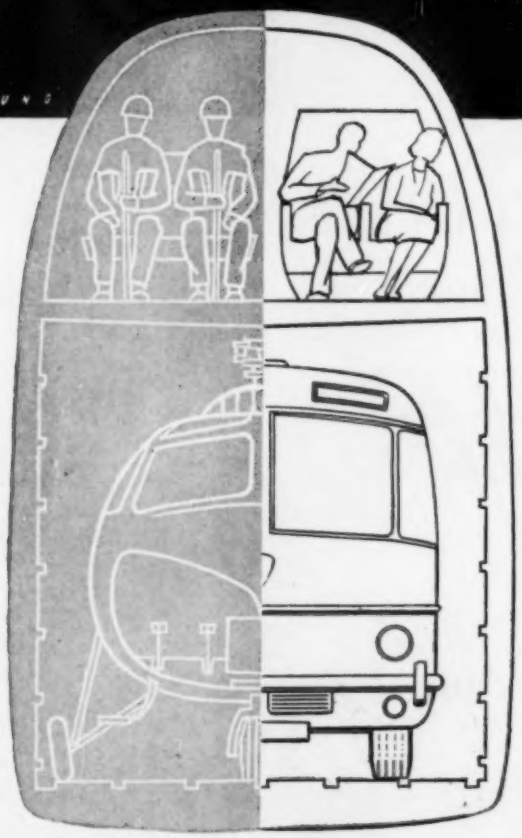

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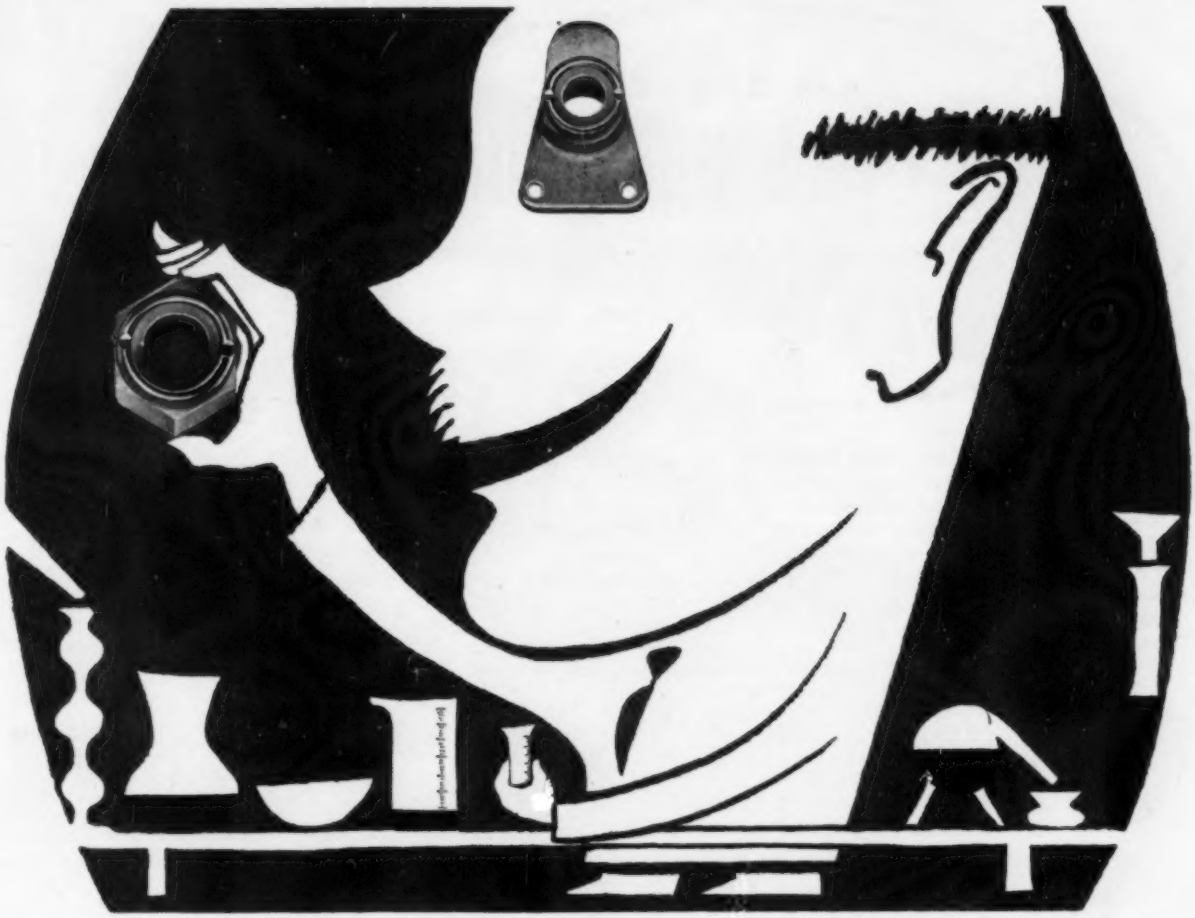

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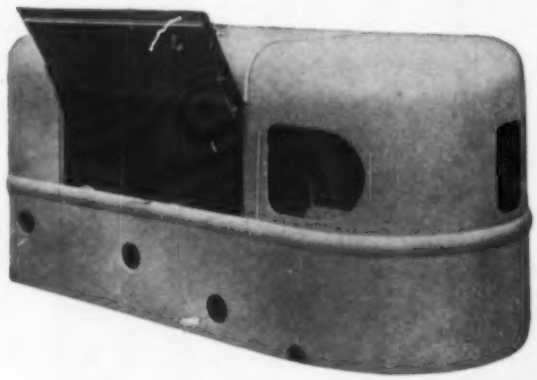

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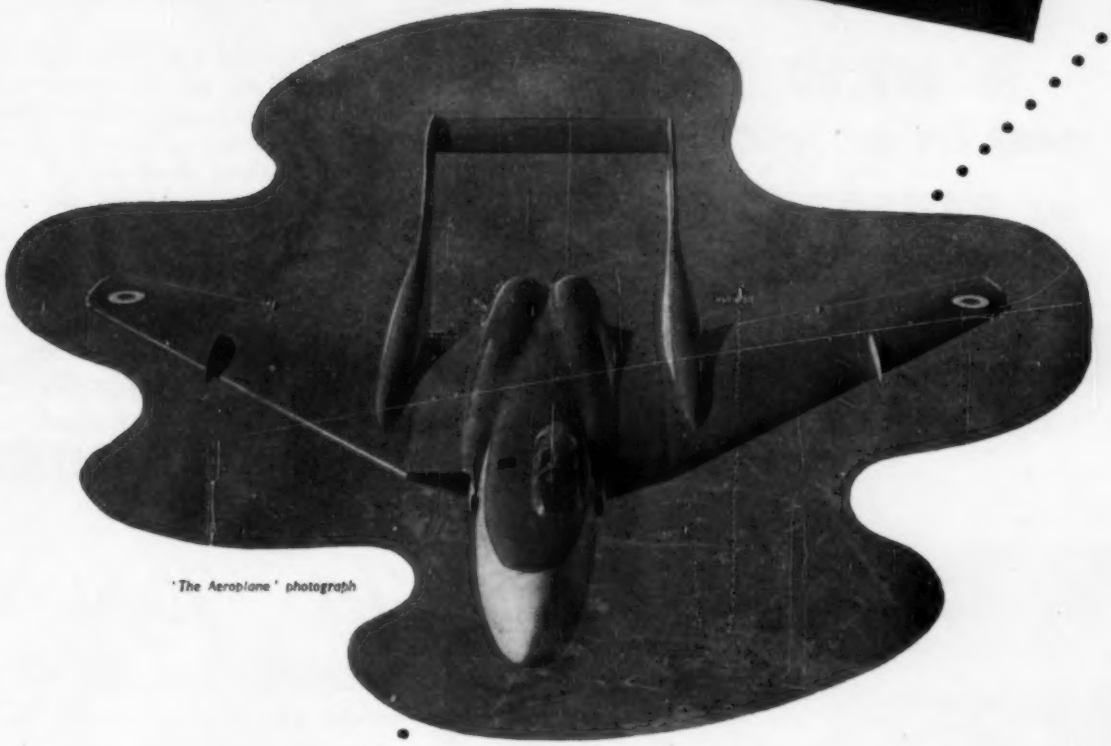

'The Aeroplane' photograph

are used on the de Havilland D.H. 110 supersonic all-weather fighter under development for the Royal Navy.

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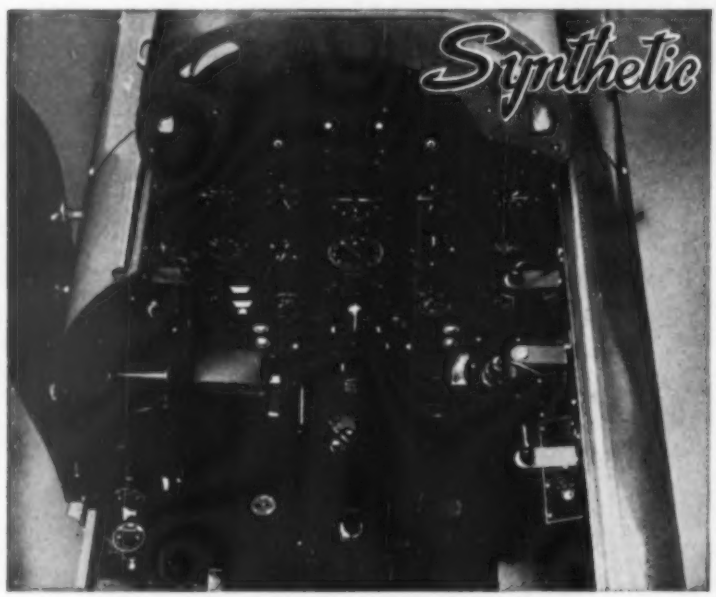

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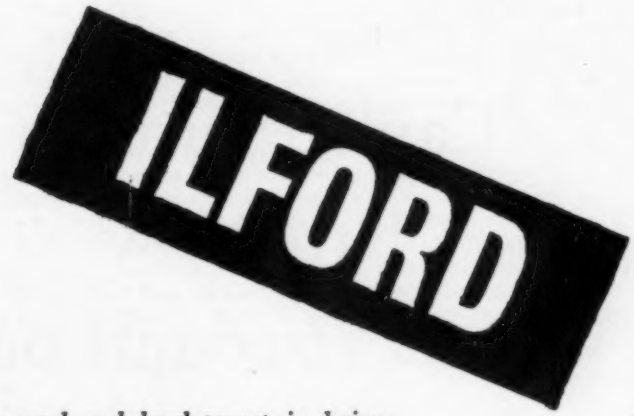

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First Aeronautical Weekly in the World

Founded 1909

No. 2396 Vol. 66. FRIDAY, 24 DECEMBER 1954

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STAMFORD STREET,
LONDON, S.E.1.

Telegrams, Flightpres, Sedist, London
Telephone, Waterloo 3333 (60 lines)

Branch Offices:

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Industry or Infantry?

EVERYONE is agreed that Great Britain cannot afford to waste or misuse skilled manpower. During the last few years there have been all too many deplorable instances of apprentices completing their technical training in the aircraft industry, only to be whipped into uniform for many non-productive months of square-bashing and spud-peeling.

National Service is an unfortunate necessity, and we would be among the last to suggest favouritism in selection or the opening of additional loopholes for those who seek to avoid it (men, we may add, who by peeling potatoes would probably be doing a more useful job than at any other time in their lives).

The plain fact is that as a result of conscripting trained draughtsmen and engineers the country is getting its new military aircraft later, and is also losing orders from abroad, through lack of capacity to handle design and drawings in a reasonable time. One of the major manufacturers recently quoted to us figures in months for the delay in production of a new first-line aircraft, occasioned by the loss over a period of a considerable number of young draughtsmen—trained by the company—for military service.

The situation is aggravated by the fact that some of these men do not return to the industry which has spent time and money in training them; and it is in any case a ridiculous situation, because in the event of war these men would certainly be reserved for industry rather than be called to the colours.

In the New Year, the trying shortages of craftsmen and technicians which all three Services are facing can be expected to lead to a new drive to obtain such specialists. This would be both necessary and commendable; but let there be no loss of perspective or selfish grabbing of men. Where will a man's training be most profitably applied—and with the minimum of disruption? One engineer can either help to make an aircraft or help to operate it. Does the egg or the bird come first?

Cash *and* Carry

WHILE we have heard none of the details of the case at first hand, we are on principle sympathetic towards Aly Khan, who was not allowed to board a Viscount on which he had booked a seat to Dublin. Apparently he arrived a little late at London Airport. We have felt for some time past that there is still too much of the "It's a privilege to fly with us" attitude about airline staffs.

Obviously there must be system and time-keeping, and so long as the services of Customs and other officials have to be retained they must be given time to do their jobs. Even so, when a passenger has paid his fare—a large one and in advance—he has a right to expect a helpful rather than an obstructionist attitude in the event of his happening slightly to overstep the arbitrary deadline of twenty or thirty minutes before take-off. This is a very different thing from holding up the departure of an aircraft.

What (we hear the uniformed cries from all sides) if everybody turned up late? We do not believe everybody would; some people habitually arrive early, many others use the airline bus. However, we are concerned with attitude as much as practice; if air travel is going to become really competitive with surface transport these arrangements will have to be better buttoned-up. That improvements in passenger handling and aircraft turn-round are possible is already evident at many American city airports.

As for air freight from London. . . how many hours' or days' prior delivery are required for clearance and completion of papers? This is another matter that will call for improvement before freight becomes a really important item for British operators.

STRANGE neighbours in this seasonable issue—atomic capability and "Junior Flight"; supersonic fighters and Sherlock Holmes. Strange world. Strange times. But over all the sincere and never-changing wish—A MERRY CHRISTMAS ☆ ☆ ☆ ☆ ☆ ☆ ☆

FROM ALL QUARTERS

Royal Lecture

CHURCH House, Westminster, was filled to capacity on the evening of Thursday, December 16th, when the Duke of Edinburgh delivered the tenth British Commonwealth and Empire lecture before the Royal Aeronautical Society. The subject he had chosen was *Aviation and the Development of Remote Areas.* Sir Sydney Camm, president of the R.Ae.S., introduced the Duke, and later, after thanking him at the end of the lecture, presented him with a diploma of honorary fellowship of the Society.

Surveying the uses of and the need for aviation in the various bush and outback areas of the Commonwealth, largely on the basis of his personal experiences, the Duke described first the conception of aviation in the outback. He went on to deal in turn with the uses of aircraft for agriculture, pest control, surveying and freight-carrying, and for other uses such as the flying doctor service in Australia.

He next discussed the requirements for specially built aircraft for these duties, and submitted that the British aircraft industry should not ignore the Commonwealth's demand which clearly existed at present.

In his conclusion, the Duke said "Aviation has become a vital and integral part of the civilization of the countries of the Commonwealth and Empire and their further development depends upon operators demanding, and the aircraft industry producing, machines capable of doing a wide variety of work cheaply and efficiently."

A full account of the Duke's lecture will appear next week.

THE DUKE OF EDINBURGH becomes an honorary fellow of the Royal Aeronautical Society. Sir Sydney Camm, the president, hands him his diploma.

Fighter Deliveries

UNDISGUISED concern about the rate of delivery of new fighter aircraft was expressed in the House of Commons on December 16th by the Prime Minister.

He said that monthly reports had been made to him for a long time past, and he had studied them "not without anxiety."

Later, in reply to Mr. Frank Beswick (Lab., Uxbridge), he said he was quite certain that everything in human power, assisted by super-priority, had been done to introduce modern swept-wing aircraft into service—"but whether the results had achieved all we hoped for, or wished, is another matter."

Sir Winston rejected the suggestion of a Royal Commission to inquire into delivery delays, but said that full statements should be made on the position after the Christmas recess by those ministers concerned.

The Prime Minister mentioned the possibility of "some special occasion" for a debate, although the matter could clearly be ventilated when the House considered Defence, Supply and Air Estimates early in the new year.

Speaking at the recent 50th anniversary dinner of the Royal Society of British Sculptors a few days earlier, the Secretary of State for Air, Lord De L'Isle and Dudley, V.C., had also referred to the matter of fighter deliveries.

The Minister said: "I have noticed a certain number of comments lately about the late delivery of aircraft. I am not going to pretend that the development of our new fighters has gone as well as we had planned and expected. I for my part want to say that as far as the air goes the state of affairs is not nearly so depressing as has sometimes been made out.

"The Hunter is a beautiful aircraft, lovely to look at, the pilots tell me, wonderful to fly. You would not think from the tone of some of the comments recently published that we had already three squadrons in service and enough aircraft would soon be available to form as many more."

It is difficult to see how the Press in general could have told its readers that three Hunter squadrons are now in existence unless given that information by the Air Ministry. The Minister might have added, moreover, that—repeated applications notwithstanding—the Press has been afforded no facilities to visit the new squadrons. On the occasions of visits to the Royal Air Force by foreign missions or dignitaries—the German parliamentary delegation on November 26th, for example—the Press has been permitted to examine and photograph as many as four Hunters.

Other references in the Air Minister's speech were to the all-weather Gloster Javelin, which he said was progressing well, and would soon be in squadron service, and also to the Vickers Armstrongs Valiant, which far outclassed in striking power anything that the Service had previously had and which would also be in service in the near future.

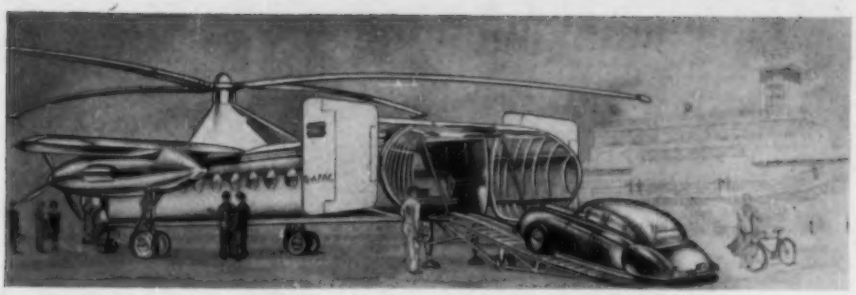
The Rotodyne's Eland

SINCE the Napier Eland was first fully described in our issue of July 23rd last, this neat turboprop has frequently been in the news—the latest occasion being last week. The basic engine is a single-shaft unit, with a ten-stage 7:1 compressor, six tubular combustion chambers and a three-stage turbine. The design embodies various unique and valuable features which increase the mechanical and combustion efficiencies and make the Eland particularly easy to overhaul.

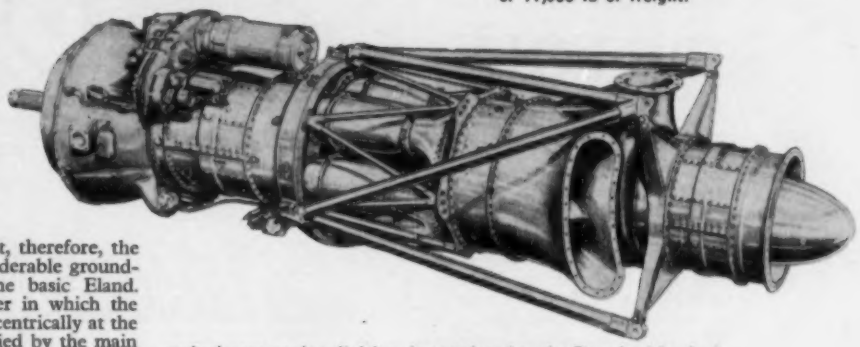
One version of the Eland is being developed specifically for application to rotating-wing aircraft supported by a gas-driven rotor and propelled by conventional airscrews. The Napier gas-turbine division are devoting much effort towards the development of power units for advanced types of helicopter; the first result of this work that could be published was the Oryx, a gas turbine arranged to deliver all its power in the form of hot gas diluted by air from an auxiliary compressor.

The new Eland, which has the Ministry rating NE1.3 and the

IN THE NEWS: The U.S.A.F. 47th Bombardment Wing (light) have been much in the news of late, owing to their atomic capability and the fact that they are permanently based at Sculthorpe, Norfolk. This line-up of their 70 North American B-45Cs recalls a similar picture which we published on July 25th, 1952, when the same aircraft arrived. During the intervening period, these ageing machines have given excellent service.



FERRY ROTODYNE: This impression of a Fairey Rotodyne emphasizes its potentialities as a car-ferry transport. Its rear-loaded fuselage will be capable of accommodating three cars and 12 passengers—virtually the same load as that carried by Silver City's Bristol Superfreighters. Alternatively, the Rotodyne could carry 45 passengers or 11,000 lb of freight.



AIR- AND SHAFT-POWER: This drawing of the Napier E.151 Eland illustrates the manner in which the auxiliary air compressor has been attached to the turbine end of the basic engine. The airscrew shaft is at the far left. The engine is described on this page.

company number E.151, also has an auxiliary compressor. On the other hand (and unlike the Oryx) it also has a reduction gearbox and drive for an airscrew, so that the front end of the engine is almost identical with that of the standard "fixed-wing" Eland. To a great extent, therefore, the Rotodyne power unit will benefit from the considerable ground- and flight-experience now being gained by the basic Eland.

The accompanying drawing shows the manner in which the auxiliary axial compressor has been mounted concentrically at the rear of the engine, supported by a structure carried by the main tubular engine-mounting. The compressor is fed from a plenum chamber, and is driven from the main engine *via* a Sinclair-type hydraulic coupling; the drive to the airscrew reduction gearbox is permanent.

In the Fairey Rotodyne, the big 90ft rotor has four hollow blades, each of which contains ducting leading cold air to combustion jets at the blade tips. This air is supplied entirely by the auxiliary compressor, the outlet from which can be seen as a circular flanged hole directly above the rear of the engine. The hot exhaust from the gas turbine passes out through a bifurcated duct on either side of the auxiliary compressor.

During the brief take-off run and climb-out, the Rotodyne will be supported by its tip-burning rotor. The hydraulic clutch to the auxiliary compressor will be filled with oil, so that the slip is no more than two per cent; and each airscrew-drive, although running at full r.p.m., will absorb no more than about 50 h.p., owing to the fact that the airscrews will be in fully-fine pitch. As the aircraft climbs away, oil will be drained from the auxiliary-compressor coupling, so that the air delivery to the rotor will progressively decrease. At the same time, the airscrew pitch will be increased.

In full forward cruising flight, the Rotodyne rotor will autorotate, and the auxiliary compressor will merely windmill under the influence of the air drawn through the rotor by centrifugal induction. All the power will be absorbed by the airscrews.

Rolls-Royce Senior Appointments

A NUMBER of senior executive appointments within the Rolls-Royce organization were announced last week.

Lord Hives, C.H., M.B.E., LI.D., D.Sc., relinquishes the position of joint managing director, but remains executive chairman of the company. Mr. A. G. Elliott, C.B.E., ceases to be joint managing director and chief engineer and is appointed executive vice-chairman.

Mr. J. D. Pearson, Wh.Sc., B.Sc.(Eng.), who is a director of the company and chief executive of its aero division, is appointed managing director, aero engine division. Dr. F. Llewellyn Smith, M.Sc., D.Phil., who holds corresponding positions in the motor car division, is similarly appointed managing director of that division.

Mr. A. A. Rubbra, B.Sc., who has been deputy chief engineer, aero engine division, is appointed to the Board as a technical director. Mr. A. F. Kelley, B.Sc., general manager (manufacturing) aero engine division, is appointed to the Board. Mr. A. A. Lombard, F.R.Ae.S., becomes chief engineer, aero engine division. Mr. D. R. McDonald, C.A., is appointed secretary to the company, in succession to Mr. G. D. L. Carnegie, who has resigned.

Mr. Pearson joined the aero-engine design staff in 1933, and has since travelled extensively in connection with the company's overseas business; he has also played an important part in organizing production at new plants, both during the war and for the recent rearmament drive. Dr. F. Llewellyn Smith also joined the company in 1933, as a graduate engineer; though closely concerned with Merlin production during the war, in recent years he has been engaged mainly on the car side of the business.

Mr. Rubbra has been with Rolls-Royce for 29 years, specializing in aero-engine design; in 1940 he was appointed chief designer, aero engines, and in 1951 deputy chief engineer. Mr. Kelley's connection with the company began in 1939, when he acted as a consultant on works layout and organization; he was appointed assistant works manager at Glasgow in 1940, returned to consultancy after the war, and rejoined Rolls-Royce in 1949, being appointed general manager, manufacturing, in 1951. Mr. Lombard, who joined the company 1943, has been closely concerned with gas-turbine design, particularly at the company's northern factories; he was made chief designer, aero division, in 1949. Mr. McDonald joined Rolls-Royce in 1938.

Hunting Percival Exports

MANNED by personnel of the Royal Swedish Air Force, and carrying two of the makers' technicians, the first of "a substantial number" of Hunting Percival Pembrokes left Bovingdon on December 15th for an airfield near Stockholm. The Swedish Pembrokes are similar to those supplied to the R.A.F. and have rearward-facing seats for ten passengers. Deliveries of similar aircraft have already been made to the Royal Belgian Air Force and the Royal Rhodesian Air Force.

Five days before the first of the Swedish Pembrokes left England, a second batch of Provost T.53s—numbering three aircraft—left Croydon for Rangoon. As previously, they were flown by pilots of Fieldair, Ltd., a company of the Hunting Group which specializes in the air-delivery of any type of aircraft to destinations throughout the world.

DERBY RE-APPOINTMENTS: In addition to Lord Hives and Mr. A. G. Elliott, whose features are familiar to many of our readers, those concerned in the new Rolls-Royce appointments (see news item in column 1 above) are, left to right: Mr. J. D. Pearson, Dr. F. Llewellyn Smith, Mr. A. A. Rubbra, Mr. A. F. Kelley, Mr. A. A. Lombard and Mr. D. R. McDonald.

NEW PUNCH for SUFFOLK

"FLIGHT" PHOTOGRAPHS

Two of the new Republic F-84F Thunderstreaks take off in formation from R.A.F. Bentwaters, Suffolk, to give the first demonstration of this aircraft in England. They belong to the 81st Fighter/Bomber Wing, U.S.A.F.

The Republic Thunderstreak and Tactical Atomic Capability

IT has never before been officially admitted that any U.S.A.F. units capable of delivering atomic weapons were permanently based in this country, but on December 10th Brig. Gen. J. D. Stevenson, commander of the 49th Air Division, U.S.A.F., revealed that for the past 2½ years the American Air Force's crack 49th Air Division has been prepared to deliver the decisive punch wherever the NATO forces might require its assistance.

It was five years ago that General (then Colonel) Stevenson suggested the delivery of atomic weapons by tactical fighter-bombers, and though his suggestion met with considerable opposition, development of the weapons and the aircraft was begun. Then, early in 1952, General Stevenson said, the 81st Fighter/Bomber Wing was deployed to England "on a crash basis," at considerable expense and outside any American commitment to NATO, to provide a deterrent to aggression in Europe. How great this deterrent was would probably never be known, but the striking power which the 81st's F-84Gs then provided was equal to the combined destructive power possessed by every U.K.-based World War 2 bomber equipped with its full bomb load, and was, and still is, sufficient to stop an aggressor dead in his tracks within 48 hours of his crossing the Iron Curtain.

General Stevenson together with Major-General R. C. Wilson, commander of the 3rd U.S. Air Division, was speaking at a demonstration at R.A.F. Bentwaters, Suffolk, of the first Republic F-84F Thunderstreaks to go into service in this country. An initial quantity of them has been delivered to the 81st Fighter/Bomber Wing during the last two months, and the whole of the 49th Air Division will eventually receive them. The Division includes three Wings, the 81st and 20th with F-84s and the 47th Bombardment Wing (Light) with B-45s, all based in Norfolk and Suffolk. The pilots and the commanders are picked personnel, most of them having very considerable experience of fighter and fighter-bomber operations during and since World War 2. In fact, Colonel Holt, commanding the 81st F.B.W., stated that in his Wing alone there were 36 pilots who had flown P-47 Thunderbolts during World War 2, and the high average age of all the pilots was only now being slightly reduced by the arrival of freshly trained personnel from Air Training Command in the U.S.A.

The F-84G Thunderjet (except for its atomic capabilities) is well known, both in the U.K. and in NATO generally. Over 4,000 have been built at the rate of nearly 170 a month, and large numbers supplied to NATO countries under M.D.A.P. It has a good performance, but is particularly notable for its very long range which can be considerably extended with the use of flying boom air-refuelling. Formations of these aircraft have crossed both the Atlantic and the Pacific by this means. The Thunderjet's successor, the F-84F Thunderstreak, is less known, although it is in quantity production and service with the Tactical and Strategic Air Command in America. The half-dozen or so which have so far reached the 81st F.B.W. were delivered by sea to Portugal and flown thence to Bentwaters.

The F-84F was originally a direct development of the G, but a number of difficulties were encountered before the production version emerged powered by the Wright J65 Sapphire, and with a deepened fuselage, new tail and new wings. It has a maximum all-up weight of some 27,000 lb, a ceiling in excess of 45,000ft, a range on maximum tankage of over 2,000 miles unrefuelled, and a top speed, without external stores, of 1.175 Mach, which it can attain in a shallow dive. It can carry 22 different combinations of armament and drop-tanks made up from rockets, 2,000 lb, 1,000 lb or 500 lb bombs, 230 U.S. gallon

A "collar" attachment of four R.A.T.O. bottles, giving 4,000 lb thrust for 13 seconds, is used to assist the take-off of the F-84F at its maximum weight of 27,000 lb. One of the two assisted take-offs demonstrated at Bentwaters is shown here.

or 450 U.S. gallon tanks. Principal combinations are 24 rockets, or four bombs, or four tanks (two large, two small), or three tanks and a nuclear weapon. To facilitate take-off at heavy load, it can carry a jettisonable collar attachment of four R.A.T.O. bottles providing 4,000 lb thrust for 13 seconds. Later models of the "F" will have a liquid-fuel rocket motor mounted internally in a small strake under the tail. This will supply 5,000 lb thrust for much longer than 13 sec and might even be used for combat boost. The "F" can also be flight-refuelled through a boom, the connection for which lies under a sliding panel, at about 50 per cent chord in the upper surface of the port wing, close to the fuselage.

The Thunderstreaks were introduced at Bentwaters with a short flying display. Four of the new "Fs" were shown in conjunction with four "Gs" supplied by the 20th F.B.W. (Colonel J. A. Dunning). Two of the "Fs" carried R.A.T.O. collars and the other two had a 230-gallon tank on each wing-root pylon. All eight aircraft started up with the assistance of ground generator trolleys and taxied away to the end of the runway. As each pair prepared to take-off, the name, age, address, and matrimonial commitments of each pilot were announced over the loudspeaker. It was noteworthy that their average age was about 29 years. The "Gs" took off in two close pairs at three-second intervals, and left the area to form up. They were followed by the first pair of "Fs" which, despite their external tanks and swept wings, used less runway to get airborne. The last two aircraft took off separately, each roaring smartly skywards soon after its R.A.T.O. began to hiss out its thick trails of white smoke. They jettisoned the collars at another airfield before returning to demonstrate.

A low-level high-speed run reveals the Thunderstreak's distinctive plan form. This particular aircraft, which carried no external stores, had just jettisoned its R.A.T.O. collar at a neighbouring airfield.

The "F" is a fairly formidable aircraft, heavy and powerful and with a touch-down speed between 135 kt and 145 kt. Unaccustomed as they were to it, the pilots treated it with some respect. The subsequent display therefore consisted mainly of extremely fast, low runs followed by spectacular zoom climbs and rolls off the top, referred to as Immelmann turns by the commentator. One of the "Fs" suffered radio failure shortly after take-off, and rather than interfere with the flying programme, the pilot landed at Shepherds Grove. The remaining three continued to make fast and slow runs which were interspersed with formation fly-pasts by the F-84Gs. By the length of time for which the sound was heard before the aircraft passed, one would judge that these passes were as fast as anything seen at Farnborough this year, and on one occasion, when R/T conversation was relayed to the spectators over the loudspeakers, the pilot was heard through a blur of static saying that he was flying at 720 m.p.h. He was then about 20ft off the runway and had developed a very slight porpoising or phugoid motion through over-control. This is difficult to avoid with fully powered controls at high speed and low level. After a short while the three "Fs" came in to land. Their approaches were fast but did not appear inordinately difficult, and while the first two made normal touch-downs, the last machine landed short. It came in slowly and quite steeply and pulled up in about the same distance as was required for its take-off with R.A.T.O.

The pilots did not demonstrate a sonic dive, probably due to the fact that the aircraft were fairly new to them and that permission for such manœuvres must be obtained beforehand. Furthermore, the visibility was not quite sufficient to guarantee that the boom would arrive. The aircraft, as already stated, are quite capable of exceeding Mach 1 and can, in fact, approach very close to it in level flight when not carrying external stores. With these, a limitation of between M = 0.9 and M = 0.94 is set according to the type of stores carried. Incidentally, the centre section tanks are mounted at an appreciable negative angle of attack. According to the planned cruising speed for the sortie, one of three different shapes of tank is fitted. Tanks seen at Bentwaters were for maximum-range flying.

The F-84F has a span of 37ft 7in, a length of 41ft 9in, an extreme height of 14ft 4in. Although originally developed directly from the "G," it has been considerably re-engineered and now bears only a superficial resemblance to it. The fuselage has been deepened to accommodate the Sapphire, so that the intake is oval. The air duct is bifurcated immediately inside the intake, with the pressure head and gunsight radar aerial mounted at the point of separation. The cockpit is faired into the fuselage contours with a hint of a "spine" leading to the base of the fin. The hood itself swings upwards and rearwards on three arms and is manually opened with spring assistance. A window on each side of the solid fairing provides good rearward visibility. Further back in the fairing there are three buried aerials, one of which is for the radio compass. A further aerial is situated inside the plastic tip of the fin. Laminated glass fibre is used for most of these di-electric sections.

The tailplane is a "slab" all-moving structure of considerable span and parallel chord, and the wings are constructed on the two-spar torsion box principle, with thick-section heavy stringers. There are neither slats nor boundary-layer fences, though the former will be fitted on later versions. The 0.5in guns are set "G"-fashion, four in the upper nose and one in each wing root, the wing guns being reloaded by belts passed through a small panel into the fuselage.

The main landing-gear is simple, but strong, with large segmented disc brakes in the wheels and narrow-section high-pressure tyres. The nosewheel is not steerable, since the mainwheels are sufficiently far outboard to give good steering with use of the toe-operated brakes alone.

The Thunderstreak's J65 Sapphire differs from its English original in having completely rearranged accessories, and considerable production modifications to internal structure. Static thrust is 7,220 lb dry. Two spring-loaded plenum chamber doors open just below and forward of the wing leading edge during take-off or slow flight.

The flying controls are fully powered with the spring bungee "feel" generally fitted in American aircraft, and with the possible addition of a bobweight to prevent application of excessive *g*. The "slab" tailplane has four operating systems. Two completely independent hydraulic transmissions are fed from an engine-driven pump and an electrically-driven pump, as in the Sabre, provides a stand-by power supply. Finally, an electric jack gives sufficient tailplane control for return to base, although a landing with this last control is inadvisable because the slow response is

(*Continued on page* 896)

A Thunderstreak shortly after landing with flaps down, air brakes out, and its slab tailplane at fully negative angle of incidence.

"MY DEAR, and to think I could have travelled Monarch!" (though perhaps it is unfair to Hunting Clan to put such words in the passenger's mouth, for the company's Yorks have lately been transporting pedigree pigs over long distances—e.g., Blackbushe to Vienna—with satisfaction to all concerned).

HERE AND THERE

Royal Patronage for A.B.A.C.

IT is announced that His Royal Highness the Duke of Edinburgh has graciously consented to become the patron of the Association of British Aero Clubs and Centres.

Which One was Homesick?

AN Italian and a South African recently left the Lido Airport, Venice, in an Ercoupe, bound for Johannesburg. The two pilots flew the same aircraft from South Africa to Venice last August in 14 days.

Pioneers Remembered

RADIO AUSTRALIA reported last week that a ceremony held at Adelaide has commemorated the 35th anniversary of the first flight from England to Australia. The pilots were the two Australian brothers Ross and Keith Smith, who in November 1919 made the 11,000-mile journey to Darwin from London in 27 days. They were accompanied by two mechanics, Sgts. Bennett and Shiers.

Christmas Spirit in the Air

ABOARD a Silver City Freighter which flew from Le Touquet to Ferryfield on December 14th was a singularly costly and seasonable load: 126 cases of French brandy, including 50 cases of 1904-vintage Grand Champagne. The brandy, valued at £4,400, was imported by the City firm of Dent, Urwick and Yeatman to meet additional Christmas demands. The firm said that delays in imports following the recent dock strike made it essential to fly the brandy across.

MR. H. V. B. BURGERHOUT, of Fokkers, in the cockpit of Hindustan Aircraft's HT-2 trainer. Visiting Bangalore "to discuss matters of mutual interest in aviation," he flew the HT-2 and said that it should give pupils plenty of confidence; he particularly praised its rudder control in barrel rolls.

First, Not Fifth

IN our leading article last week it was stated that the ultimate control of R.A.F. Coastal Command might come in for more discussion with the appointment of the new Fifth Sea Lord; this should have read "First Sea Lord".

In the Bader Tradition

ROGER PITT, a South Australian who lost both legs in a logging accident in 1950, is to try for a Commercial Pilot's Licence. He learned to fly, and gained his student pilot's licence, soon after learning to use his artificial legs. If there are objections to his flying passenger aircraft he hopes to become a freighter pilot.

Israel Incident—

METEORS of the Israeli Air Force intercepted a Syrian Airlines Dakota flying from Cairo to Damascus on December 12th and forced it to land at Lydda Airport, Israel. It was alleged that the aircraft had violated Israel territory. The nine occupants, some of whom were "investigated," were all released after two days, and the Dakota returned to Damascus.

—and Middle East Mix-up

ACCORDING to various foreign radio reports last week, the following is what happened to three British pilots who were ferrying out three Spitfires (of a batch of 30 sold by Israel) to the Burmese Air Force. On December 3rd the trio put down at Baghdad, and the Iraqi authorities arrested them, owing to the fact that, contrary to their landing permits, they had made a stop at Nicosia. On the 9th the Iraqi Air Force escorted the Spitfires back to Cyprus. *En route*, however, the radio of one machine failed, whereupon the commander of the flight decided to detour to Beirut. The Lebanese Ministry of Public Works announced that an investigation was then conducted, which revealed that the three Spitfires had flown over North Lebanon while staging from Nicosia to Baghdad, and that, it was alleged, one of the pilots held no pilot's licence.

C.A.I. Honours Mr. Dowty

SPEAKING at the joint meeting, held recently in Montreal, of the Canadian Aeronautical Institute and the Institute of the Aeronautical Sciences, the president of the C.A.I. announced that Mr. G. H. Dowty had been awarded that institution's first foreign honorary fellowship. It is known that Mr. Dowty—who is, of course, chairman and managing director of Dowty Equipment, Ltd.—gave much encouragement to the C.A.I. in its formative stages.

A Veteran's Error

ONE of Australia's most experienced commercial pilots forgot to lower the undercarriage of an A.N.A. aircraft when landing at Eagle Farm Airfield, Brisbane, and has been grounded by the company. He said afterwards that he had admitted his mistake because he wanted no reflection cast on the DC-4 or the DC-6, which in his opinion were the finest aircraft he had flown. The Australian Air Pilots' Association has made a protest over the suspension.

Woodford Memories

AT an informal dinner in Macclesfield on December 10th a number of friends met to recall the early days of club flying at Woodford, when the airfield was first placed at their disposal more than 30 years ago by A. V. Roe, Ltd. The gathering, presided over by Sir Roy H. Dobson, consisted of Arthur Ainsworth, Robb, Lewis and Jim Byrom, Albert Braid, J. C. Cantrill, "Toffee" Hall, John Leeming, Eric and Frank Lord, Basil Meads, W. E. MacVee, I. C. Maxwell, Charles M. Needham, Tom Prince, Joe Scholes, Herman Serck, Arnold Sykes, J. C. Taylor and Dr. Bill Templeton. It is hoped to repeat the reunion next year.

He's just been through the sound barrier

As the ceiling of modern aircraft becomes increasingly higher, instruments must keep pace with requirements. This newly developed Smiths Altimeter registers up to 60,000 ft. with the same precision as lower range instruments. The range has been extended by refinements in the linkages, the extensive use of jewels, and the incorporation of a special low hysteresis capsule. Size and weight are the same as standard Altimeters.

A short while ago he was testing a supersonic aircraft — doubtless using Smiths instruments designed for high speed flight. Special instruments for development work have always been a major consideration of Smiths, though the organisation is no less concerned with making sound, reliable equipment for everyday flying.

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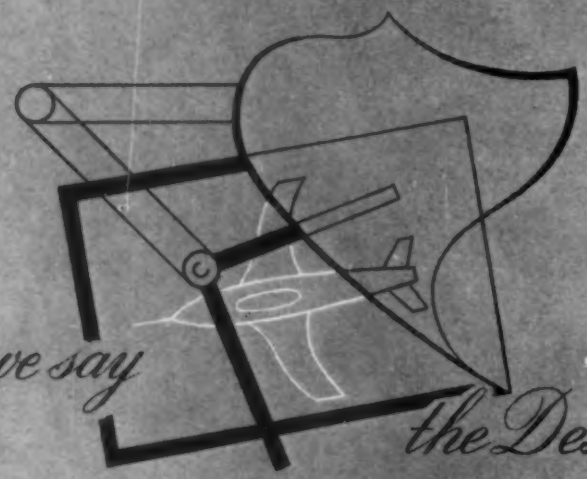

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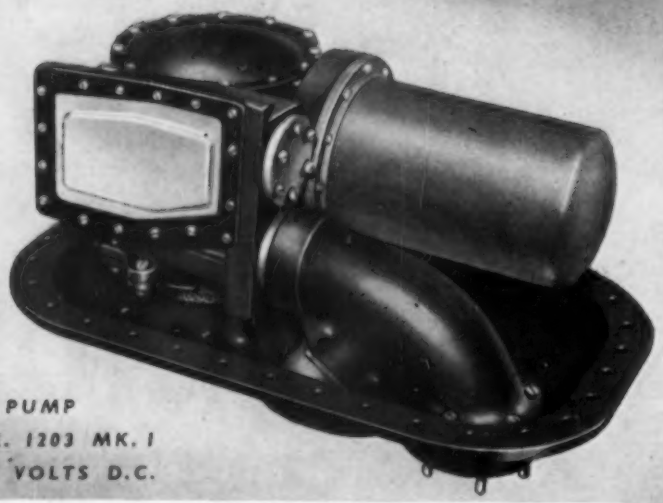

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AERO COMMANDER

A Typical American Light-Twin Executive Aircraft in the Air

by C. M. LAMBERT

AMONG the five light twin-engined executive aircraft now available on the American market is one which, since we first heard of it a few years ago, has always seemed most attractive. Called the Aero Commander, it is the only aircraft in this class to have a high wing; and it is the Aero Design and Engineering Company's first and only aircraft to date. The factory is at Tulakes Airport, Bethany, Oklahoma.

The Aero Commander is a 5/7-seater, designed for use by commercial concerns or private owners in transporting either passengers or freight over stage-lengths of 1,100 miles. In its standard version it is supplied with dual control and four seats, two for the pilots and a two-place bench seat in the rear of the cabin. Three further seats can be added at extra cost, or an ice-cabinet, a table, reclining seats or swivel chairs. The interior can also be quickly cleared to accommodate freight only.

Standard equipment includes constant-speed fully-feathering airscrews, steerable nosewheel, powered hydraulic brakes, and a thermostatically controlled cabin-heating system. It can be seen, therefore, that the Aero Commander is designed to reproduce in a comparatively small aircraft with a maximum all-up weight of only 6,000 lb all the characteristics normally associated with an airliner of Dakota size.

Recently, at London Airport, I had the opportunity to fly an Aero Commander, registered YE-2630B, which was making a short stay en route from Oklahoma to the Yemen. It already bore the colours of Yemen Airlines, in whose charter service it is to operate, and was being flown out by one of the company's Swedish pilots, Mr. Rundström.

Yemen Airlines, incidentally, is run largely by the Government of the Yemen and confines its work to charter flying. Its existing equipment consists of three DC-3s, three Cessna Cranes, a Norseman and one of the Saab Safir 91B prototypes—the one, in fact, which was fitted for some time with mock-ups of the J-29's swept wings. (It has, of course, now reverted to straight wings.) The airline's main base is at Taiz, the walled capital of the Yemen, which boasts a sloping landing ground 3,400ft above sea level, with a maximum length of 1,100 yd. The DC-3s have to land uphill and take-off downhill, regardless of wind. There are three pilots, all Swedes, and the ground staff also is Swedish. Principal charters flown are to such places as Cairo, Jedda and East Africa.

I met Mr. Rundström at L.A.P. and we drove out to the Aero Commander, which was parked in the central area. First impression of the aircraft was that it is very low on the ground, with all but the vertical tail accessible without ladders. There were three of us—Mr. Rundström; Mr. Hulten, who was staging through in a B. 50 Twin Bonanza destined for Aden; and myself. After checking fuel tanks, uncovering the pitot head, removing chocks and pulling the airscrews through (to check for hydraulicking), we entered the aircraft *via* the single door under the port wing. This, incidentally, is so arranged as to discourage attempts at entry from the airscrew side.

Mr. Rundström took the left-hand seat, and I took the right, with Mr. Hulten immediately behind me. The remainder of the seven seats had been removed to accommodate the large quantity of extra gear required for the Atlantic crossing the aircraft had just made. We had 75 gallons of fuel on board (half the maximum fuel load), three people, and carried 12-channel V.H.F., H.F. R/T., A.D.F. and manual loop.

The business end of the Aero Commander's cabin (there is no separating bulkhead) is most attractive. The instrument panel

This view from inside the cabin shows clearly how low the aircraft sits on the ground. Mr. Rundström is preparing to wipe the windshield. The engine instruments and two of the three radio sets are visible beyond the control wheel.

The Aero Commander head-on, showing how the landing lights and conditioning-air intake are arranged in the nose. The nosewheel steering cylinder can also be seen. "Flight" photographs

AERO COMMANDER . . .

is well arranged with flight instruments to port and engine instruments to starboard. Three radio control panels are distributed port, starboard and centre. Between the windscreen and the instrument panel there is a shelf where maps, notebooks, radfac charts and such items can be kept to hand without interfering in the least with vision. Pitch, mixture and throttle controls are on a central pedestal, distinctively coloured and shaped, with separate friction nuts for throttles and pitch levers. Flap and undercarriage controls are immediately below them, shaped respectively like an aerofoil and a wheel, together with a small red catch which is engaged to prevent inadvertent undercarriage retraction on the ground. Underneath the pedestal is the parking-brake lever.

The seats are extremely comfortable and compact, without armrests, and fitted with lap straps. The control columns rise from the side of the floor, and the spectacle control-wheels are carried over on booms. Rudder pedals are not adjustable, but the seats are. Each pilot has full heating and ventilating controls, an adjustable louvre by his head, and an ashtray. Earphones and microphones are hung on hooks when not required. All electrical switches, and the rudder and elevator trim wheels, both acting in the natural sense, are mounted in a panel in the ceiling within easy reach of either pilot.

Well up to the best American standards, the instrument presentation is quite exceptionally good. All figures are yellow on a black ground, and every relevant dial carries a green line along the correct operating range, with red marks for "don't exceed" settings. The single r.p.m. and boost gauges have two needles each, marked "r" (right) and "l" (left), so that the engines can be synchronized very easily. The A.S.I. has a green band over the cruising-speed range, a red mark at maximum permissible speed, and a white band over the speeds at which undercarriage and flap may be lowered. Engine instruments include boost, r.p.m., oil temperature, oil pressure, fuel pressure, and engine temperature; in addition, there are hydraulic pressure, vacuum pressure, and outside air temperature, voltmeter and ammeter gauges.

The fuel system is excellent. There are four main tanks, two in each wing, which all feed into a collector tank in the centre section. This tank then supplies both engines *via* engine-driven pumps. Stand-by electric boost pumps are used during take-off and landing and for emergency. Should all these fail, gravity feed is possible, though the carburettors will not operate at maximum efficiency in this condition. Refuelling is through a single filler neck. The whole system is controlled by two electric switches, one for each engine, and there is but a single contents gauge, on the panel. There is, therefore, no switching-over of tanks, and no adding up of several fuel gauges to be done. Mr. Rundström said that the system worked well and had given no trouble.

A normal hydraulic system, charged by a pump on the port engine, charges an accumulator which supplies power for undercarriage and flap operation, braking and nosewheel steering. Flight instruments are air-driven from a vacuum pump on the starboard engine, except for a second turn-and-bank indicator, which is electric and mounted on the starboard side of the panel. There is a gyro D.I., stand-by magnetic compass (on the windscreen central pillar), and A.D.F. or radio compass, or remote-reading compass, as required.

Thanks to the excellent layout and clear marking, all this took much less time to explain in the cockpit than it does to describe here. When the explanation was finished, Mr. Rundström picked up a plastic-covered check list from the shelf above the panel and read through the starting procedure. The fuel was switched on, main battery "on", fuel boost pump "on", port engine primed with the mixture lever, and set for fully rich and ignition switched on; then one push of the starter button brought the port engine to life. The same procedure to starboard left us happily settled for the warm-up which entailed simply sitting comfortably until the requisite needles had moved into the green sectors; it required no special knowledge of what these settings should be.

Noise level, meanwhile, was low, and vibration nil. We had a little trouble contacting the control tower on V.H.F., but soon we made a "dead cut" check on the magnetos, and began to taxi out. This is simplicity itself. First pressure on the rudder toe pedals effects nosewheel steering up to 30 deg each side, and subsequent pressure applies brake. The toe pedals are comfortable and sensitive and no actual rudder-bar movement is required. Visibility is excellent, with both wing-tips in sight from either front seat, while the nose of the aircraft is barely seen even though the coaming level is at about breast-pocket height. I taxied out just above idling r.p.m. and, though use of asymmetric throttle was effective, it was completely unnecessary. The ride on the ground was very smooth indeed.

I had ample opportunity to practise taxying, since we spent some 25 minutes in unsuccessfully map-reading our way round L.A.P. and finally had to stop and wait until the tower could locate us visually and guide us to the marshalling point on Runway 28R. Here we did the normal pitch, magneto and r.p.m. checks and set the rudder trim half a degree to starboard and the elevator trim at neutral. I took the stick for the first time and checked the working of the controls.

I now lined up and got clearance for take-off and, with one-third flap extended, was told to pull it off at 60 m.p.h., climb initially at 110 m.p.h. and, when flaps and undercarriage came up, continue the climb at 135 m.p.h. Although the A.S.I. was over on the port side, I could easily read it. I opened up to 75 per cent power against the brakes and then allowed the aircraft to roll forward at full power. There was no appreciable swing and, surprisingly enough, no marked increase in noise level. Acceleration was remarkable, and we passed 60 m.p.h. in, I should estimate, about five seconds. The Aero Commander has to be pulled off the ground quite firmly, but with elevator trim neutral is then trimmed for the climb.

Undercarriage retraction causes no trim-change and flap retraction simply a small lurch forward with no appreciable reduction in rate of climb. Settled at 135 m.p.h., and maximum climbing power, the V.S.I. registered 2,000ft/min, and we cleared the runway with about that height in hand. By the time we passed Windsor Castle, six miles away, we were already settled in a level cruise at 5,000ft—boost 22in, r.p.m. 2,600, I.A.S. 160, and approximate T.A.S. 175 m.p.h.

I experimented with the controls and found them in all cases as positive as one could wish, with no breakout force, though with a fairly high increase of stick force with stick deflection. They were extremely well-harmonized, aileron application producing no yaw in the opposite direction, and turns could be comfortably initiated with rudder alone. The amount of rudder required to initiate or hold a turn or to reverse a steep turn from one direction to the other was just about what one would consider normal for this type of aircraft.

Visibility over the low nose through the ample curved windscreen was excellent, and sideways and downwards vision was not unduly restricted by the engine nacelles.

One could say that in certain conditions, particularly at the lower air speeds, the stick forces for large control movements are rather high, but the trimmers are ready to hand, sensitive to just the right degree, and fully effective over a very wide range. This was shown when Mr. Rundström cut the port engine and feathered the airscrew. The yaw produced by cutting one engine was positive, but not in the least alarming, and very easily controlled with the rudder. There was no sudden wing-drop. Once feathered, the airscrew was turned with the starter motor into the vertical axis to avoid interference with the airflow over the wing. It was quite simple to trim out the dead engine for hands-off flight, which stabilized at 140 m.p.h Turning into and away from the dead engine was quite comfortable and any tendency to height-loss easily held. In fact, control did not deteriorate. By alternately reducing power on the live engine and trimming, I took the Aero Commander down to 85 m.p.h. without touching the controls. At this point I had come to the end of the rudder trim range and was still just about maintaining height on the starboard engine alone.

Mr. Rundström now re-started the port engine and opened it up to cruising power when it had warmed up again. Up till now I had also experimented with the air-conditioning system, and with no trouble at all had produced a pleasant drawing-room warmth in the cabin. Abandoning the controls, we settled down to light cigarettes, but Mr. Rundström's louvre was so adjusted that it blew out three matches before we finally lit up successfully. During this time we had our heads well together and the aircraft flew steadily onwards. The Aero Commander can in fact, be trimmed hands-off and left to fly itself for long periods of

time, and it is considered quite unnecessary to fit an autopilot, even for the long stages of an Atlantic crossing, when the endurance may, with an extra fuel tank, reach something of the order of nine hours. The fact that Mr. Hulten was moving round the rear of the cabin making good use of the ciné camera did not appear to affect the Aero Commander's stability in hands-off flight. We were also markedly free from that discordant thrumming which denotes that the engines are not synchronized, since the overlapping boost and r.p.m. needles made synchronization an easy matter. Though we were smoking continuously, the cabin atmosphere remained completely free of smoke, thanks to the copious circulation of warm air.

We next tried some stalls. Mr. Rundström demonstrated that the Aero Commander could be flown with half flap and a high power setting at no more than 40 m.p.h. I.A.S. The nose was very high, but control appeared good. Raising the nose a little higher produced a rapid stall with very little warning. The port wing dropped about 30 deg and with engines on was held at that level on aileron. Total height lost in recovery was only 120ft. The aircraft is very clean and the speed rises rapidly as soon as the nose drops. At 15 to 20 m.p.h. above the stall, depending on angle of attack, the stall warning indicator fitted under the starboard leading edge produces a thin piping noise which can be heard all over the cabin.

I took control again and tried the stall with the aircraft "clean" and power off. Closing of the throttles sounded a small horn and the stall warning indicator again joined in, and the stall came with the nose high and full backward stick at 60 m.p.h. Again the wing dropped sharply to port and could be delayed, but not lifted, with opposite rudder. Immediate application of power and a forward pressure on the stick rapidly unstalled the aircraft and climbing flight was re-established after a height loss of about 500ft. Again, the increase of stick force as the full range of movement was reached was pronounced; but response remained good and the stick force could be an effective deterrent to reaching the stalling angle of attack.

For a few minutes more, as we returned to L.A.P., I played about with the aircraft, trimming it into turns, trying steep turns, and reversing them as fast as possible. Checking the characteristics of flap and undercarriage extension, I found that both—particularly the flaps—came down quite rapidly, but only the latter produced any marked trim-change. The flaps are large and extremely effective, and if the throttles are suddenly closed with full flap extended the aircraft drops sharply. This I found to my cost on my first attempt at landing.

On the downwind leg I reduced speed to 120 m.p.h. by throttling back and gaining height, lowered undercarriage and half flap and set 14in boost and fully fine pitch for the engines. We made the approach at 100 m.p.h., the recommended figure. This may seem slightly high, but flap and power are so plentiful that the angle of approach at this speed can be almost infinitely varied. The first approach I made quite shallow; and as I crossed the hedge, still at 100 m.p.h. and about 10ft up, I cut both throttles, thinking to lose what I considered excess speed in relation to the stalling speed. The aircraft dropped very suddenly and both Mr. Rundström and I heaved the "pole" back while the aircraft sank smartly but not violently on to the runway. Despite this sudden control movement the stall warning indicator did not sound, and there was no hint of a sudden stall.

Once on the ground the nosewheel can be held up, but this requires some effort. It is best lowered straight on to the runway and full advantage can then be taken of the excellent nosewheel steering and braking afforded by the toe pedals. The landing run I found to be short, although I did not use the brakes.

AERO COMMANDER 560, PRINCIPAL DATA

Two six-cylinder Lycoming GO-480-B, 270 h.p. each for take-off

Maximum a.u.w., 6,000 lb; disposable load, 2,100 lb; usable fuel capacity, 145 U.S. gal; max. speed, 206 m.p.h.; cruising speed (70 per cent power, 10,000ft) 197 m.p.h.; service ceiling, 21,900ft; single-engine ceiling, 8,400ft; stalling speed (undercarriage down, 40 deg flap, power off), 59 m.p.h.; range (at 55 per cent rated power, at 10,000ft, with 30 min reserve), 1,050 miles. Span, 44ft; length, 34ft 2½in; height to top of fin, 14ft 9in.

We had landed on 28 Left and therefore taxied over to 28 Right to make a final circuit. After a further magneto check, we lined up and this time I was prepared for the rapid acceleration; we climbed away at an exhilarating angle after a very short ground run. We reached 1,000ft quickly and, throttling back to circuit power, flew over the downwind leg. Undercarriage and flaps were again lowered and electric fuel-boost pumps switched on, and this time I tried a steeper approach, again at 100 m.p.h.

With full flap and about one quarter power, this was quite comfortable, although the rate of descent was fairly high. The trimmers and the controls remained fully effective. I began the round-out fairly early, reduced power very slowly, and touched down on the main wheels with hardly any appreciable float. There was a cross-wind component of about 15 m.p.h., but control was ample to cope with it. As soon as we touched, I put the nosewheel down and used the brakes. They felt powerful and smooth. With a little practice, I feel, the Aero Commander could be made to produce first-class small-field characteristics, although for really rough ground the fuselage is possibly a little low-slung. On the way back to the central area, I really enjoyed the excellent ground handling characteristics. The engines could be idled, and allowed to cool off, so that we switched off almost as soon as we had stopped. I must admit that I was then very sorry to have to leave the aircraft.

The engines had been running for well over an hour, and we had been airborne for some 55 minutes at various power settings; yet we had used only 26 of our 75 gallons. Finally, Mr. Rundström showed me the operation of the air-conditioning system on the ground with the engines off. The fan can be driven from the batteries, and on this occasion produced a gentle flow of ice-cold air in the cool setting, and warm when switched to "hot". Before we left the aircraft we replaced the chocks, taped over the pitot head, inserted external and internal control locks in stick and elevators, and closed the door (which has a Yale-type lock).

As an executive transport—and as such the Aero Commander was designed—I could think of no pleasanter aircraft. It has all the qualities one could desire, either as a pilot or passenger, and just that degree of convertibility and adaptability which the average operator would from time to time require. Incidentally, this particular machine has been provided with a patent crop-spraying conversion kit by Burnum Aviation, of Arlington, Texas. A spray bar is mounted under each wing, three venturis providing pumping power. The liquid spray is carried in two 200-gallon tanks in the cabin.

Radio equipment in this Aero Commander included a Lear 12-channel V.H.F. transceiver, a Lear H.F. R/T transceiver, a Lear A.D.F. and a manual D.F. loop. For the Atlantic crossing, which was made *via* New York, Gander, Greenland, Keflavik and Prestwick in a flying time of 48 hours, obligatory extra equipment included Collins H.F. R/T-W/T long-range transceiver, a 5/7-man life-raft, a "Gibson Girl" emergency transmitter and comprehensive survival equipment for which snow-shoes, fishing gear, sleeping bags and the like were mandatory. An extra fuel tank was also installed behind the cabin rear bulkhead to provide an extra three hours' endurance. To accommodate all this, four of the seven seats which this particular aircraft will carry were removed.

Mr. Rundström was accompanied by a navigator for the crossing and said that it was quite a routine flight despite some bad weather. The longest hop was Keflavik-Prestwick, which was made of necessity below freezing level and at low speed, and took some six hours.

For the European market, I can see only one factor which militates against the Aero Commander, and that is its price—$69,500 (about £24,820) for the standard model, ex-works.

Mr. Rundström of Yemen Airlines inspects the aircraft before take-off from L.A.P.

NEW PUNCH FOR SUFFOLK

(Concluded from page 891)

then insufficient for the approach and round-out for touch-down.

The Thunderstreak's flaps are of the simple trailing-edge type, hydraulically operated. Speed brakes are large, liberally perforated surfaces which extend from the fuselage sides just aft of the wing trailing edge. They open quite slowly and are controlled from a switch on the throttle lever.

The centre-section pylons carry either a wing tank, a bomb or eight rockets each. Further tanks and bombs are mounted on single pylons near the wing tip, but rockets carried here are attached, two deep, on three separate carriers each side.

The cockpit follows standard American practice for aircraft of this type. Rudder pedals are on a level with the seat cushion and instruments in four tiers on a vertical panel. Remaining controls are distributed on long consoles on either side. The gunsight is the radar-ranging A.4 adapted for an undisclosed type of bombing system. General colouring is black with all figures in yellow or white. The six basic flying instruments are grouped centrally as is now becoming standard in the U.S.A.F. The A.S.I. is of the two-needle type, the second (red and yellow) needle indicating the speed in knots equivalent to the aircraft's limiting Mach number. Fuel contents, fuel flow and engine r.p.m. indicators are as for the Sabre and F-84G. Instruments are internally illuminated.

A number of red buttons for bombs, guns, radar lock-out, R/T, together with stick-mounted four-way trim button and throttle-mounted dive-brake switch are again similar to those of the Sabre. A dial-type navigation computor is fitted on the right of the cockpit on a movable strut, so that the pilot can use it with one hand while flying.

The ejector seat is of the semi-automatic type, the first movement of the trigger initiating the charges which blow off the canopy, and the second movement firing the seat. The arm rests, incidentally, can be slid back out of the way if not required. After ejection, the pilot is automatically released from the seat, but then has to operate his parachute manually.

The oxygen supply is of the demand regulator type, fed from a liquid oxygen convertor. Oxygen in its liquid state cannot be stored for long periods, and is therefore obtained locally from the British Oxygen Company. Pressurization is automatically controlled through a three-position switch to select either plain ram ventilation, normal pressurization at 5 lb/sq in differential or at 2.5 lb/sq in (28,000ft cabin altitude at 40,000ft) if, as an American officer said, the pilot is "in a combat situation." Windscreen de-misting is by hot air.

The internal fuel capacity is 570 U.S. gallons and supply from this and external tankage is automatic if "all tanks" is selected.

(Above) The head-on and side views of the F-84F-40-RE show the wide track undercarriage and wing anhedral as well as the large number of buried aerials in cockpit fairing and tip of fin.

(Left) The hood-opening mechanism of the Thunderstreak is distinctive. The new Wing insignia can be seen on the fuselage side.

If the generator fails, however, tanks must be selected manually. Maximum fuel load for ferrying purposes, without war load is 1,930 U.S. gallons, which accounts for the extreme range, unrefuelled, of over 2,000 miles. Radio equipment is up to the most recent American standard with all aerials of the buried type. It includes a radio compass and an U.H.F. R/T communications set which can provide a very large number of frequencies, of which 12 are normally used at one time.

The Thunderstreak should provide the 49th Air Division with considerably improved striking power when it is in full service. At present, with the Thunderjets, the squadrons regularly fly to Germany, France and North Africa, refuelling in flight if necessary. The Thunderjet is in any case capable of flying in one hop from Suffolk to Casablanca—a short trip, according to the pilots, which takes them little more than 2½ hours. If they rendezvous with a tanker they can make this flight at low level. Formations are completely mobile, and using an airfield maintenance system similar to that of Strategic Air Command, can move wherever they wish in the free world. Finally, it was stated at Bentwaters that a number of F-84Fs are being modified for FICON missions so that they can be carried under the belly of a B-36 and add the latter's phenomenal range to their own high speed and manœuvrability for ultra-long range atomic strikes. The modification consists quite simply of fitting a tailplane with pronounced anhedral and attaching three suspension points, two each side of the fuselage and one on the extreme nose.

The F-84F can be considered as one of the first of the atomic age bombers. The bomb load now required to give tremendous destructive power is so small that it is best carried by a long-range fighter which stands the best possible chance of eluding intercepters and avoiding radar detection. To envisage the effectiveness of this type of attack aircraft, one need but recall the statement of a prominent Japanese statesman at the end of World War 2 to the effect that, once the Hiroshima bomb had been dropped, the situation of the Japanese became impossible, since every blip on the radar screen, though it indicated only a single aircraft, might herald the arrival of another and possibly more destructive atom bomb. The F-84F is one of a number of diminutive but mighty fists which can deliver such a knock-out blow. C. M. L.

FORTHCOMING EVENTS

Dec. 29. British Institution of Radio Engineers: Discussion on "Education and Training of Radio Engineers."
Jan. 4. R.Ae.S. Section Lecture: "Recent Advances in the Knowledge of Transonic Airflow," by C. H. E. Warren, M.A., A.F.R.Ae.S.
Jan. 6. R.Ae.S. Main Lecture: Lecture to young people, by P. G. Masefield, M.A.(Eng), F.I.A.S., F.R.Ae.S.
Jan. 8. British Interplanetary Society: "Using Hydrogen Peroxide," by A. V. Cleaver, F.R.Ae.S., and "Liquid Oxygen as a Rocket Propellant," by S. Allen, M.I.Mech.E., A.F.R.Ae.S.
Jan. 8. British Interplanetary Society (Midlands branch): "Spectroscopy in Astronautics," by W. H. T. Davison, M.A.
Jan. 14. Helicopter Association: Brains Trust.
Jan. 15. British Interplanetary Society (North-west branch): "High-Speed Flight," by R. J. Boor, A.M.C.T.
Jan. 15. Women's Engineering Society: New Year luncheon.
Jan. 24-28. Institute of the Aeronautical Sciences: 23rd Annual Meeting and Honors Night dinner, New York.
Feb. 1. Institute of Transport: Informal luncheon.
Feb. 5. British Interplanetary Society: "The Development of the Snarler Rocket Motor," by D. Harden, B.A., Grad.I.Mech.E.
Feb. 11. Helicopter Association: "Development Experiences with the Bristol Type 173," by R. Hafner, F.R.Ae.S.
Feb. 14. Institute of Transport: Brancker Memorial Lecture: "Influence on Civil Aviation of Some Current Researches," by Sir Arnold Hall, F.R.S.
Feb. 23. Royal United Service Institution: "Rocket Propulsion and its Implications to Human Society," by A. V. Cleaver, F.R.Ae.S.
June 10-19. Paris Aero Show.

R.Ae.S. Branch Fixtures (to Jan. 25):
Jan. 3, *Belfast*, "Model Making," by T. Gowan. Jan. 5, *Luton*, Junior Night. Jan. 6, *I.O.W.*, "Case for the Light Fighter," by P. A. Norman. Jan. 11, *Boscombe Down*, "Domain of the Helicopter," by R. Hafner. Jan. 12, *Manchester*, "Hydraulics," by E. J. Nicholl. Jan. 20, *I.O.W.*, "Titanium," by Major P. L. Teed. Jan. 25, *Belfast*, "The Helicopter—Has it a Future?" by F. H. Robertson.

A Boost for Mother Earth

THERE has been a great deal of literature on the subject of space travel. The main difficulty, it appears, is how to achieve the escape velocity of seven miles per second that will enable the space-ship to leave the earth's gravitational field.

Since the invention of the jet engine this problem should present no difficulty at all. The solution is plain!

The earth spins on its axis at the rate of one revolution in twenty-four hours. The speed is approximately a thousand miles per hour at the equator. Due to centrifugal force, bodies at the equator weigh less than they do at the Poles. If this centrifugal

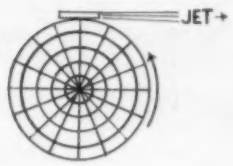


Fig. 1

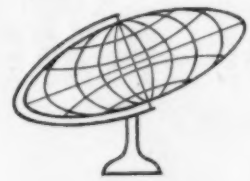


Fig. 2

force could be increased, the weight at the equator would be reduced still further, and it is therefore merely a question of increasing the speed of rotation of the earth.

Now, if we had enough gunpowder we could make the earth into a gigantic catherine-wheel, and increase the speed in no time. We have, however, another force at our disposal, namely, jet propulsion. All we need to do is to place an appropriate number of jet engines on the equator, line them up facing east, and firing west, and the impetus must in time accelerate the earth's speed of rotation (Fig. 1). The acceleration might be small in amount, but if continuously applied, it must eventually be considerable.

Centrifugal force increases as the square of the speed. If the rate of rotation is doubled, the centrifugal force increases four times. It should follow, therefore, that by increasing the earth's rate of spin a sufficient amount, the weight of anything on the equator might be reduced to nothing at all, and your space-ship would require only a small amount of power to get going on its way.

Writers of science fiction might care to entertain us with stories of malevolent scientists, of evil intent, speeding up the earth to

Fig. 3

Fig. 4

rates beyond the safety limit. With a very great increase in speed, apart from reducing the working day to two or three hours (and, of course, our hours of sleep), the map-makers would be hard put to it to keep abreast of the changing contours of the continents. The earth, we are told, is not a sphere but, due to its spin, an oblate spheroid. Its diameter at the equator is greater than from Pole to Pole. By speeding up the rate of spin, this spheroid would become more oblate still, and our terrestrial globes would, presumably, begin to look like Fig. 2—until, at twenty-five thousand miles per hour, the earth must assume a disc-like form (Fig. 3) and be liable to disintegrate—jet engine and all—and possibly look something like the rings of Saturn (Fig. 4).

We had better keep the rate of rotation no higher than is necessary. Even with a moderate increase, centrifugal force might cause the heavy land masses to gather themselves together in the equatorial zone, as in Fig. 5. All the land together as one continent. One world at last!

Then what about the atmosphere? If, due to centrifugal force, the air all accumulated around the equator, possibly stretching far out into space and denuding the Poles of atmosphere in consequence, it might be awkward for the human race; and, as the velocity of hydrogen and other gaseous molecules is, I understand, frequently many miles per second, the air might possibly escape altogether and leave us all dependent on oxygen masks.

In the meantime, long before this happened, would there be other problems to reckon with? Earthquakes, winds of terrific force, tides against which ocean liners would battle in vain? At present the air at the equator is moving at one thousand miles per hour, while that at the Poles is (theoretically) stationary. Any movement of air in a north-south direction leads to complications in the east-west direction, and tends to make life difficult for weather forecasters. What the effects would be if the difference of air speed at the Poles and equator were two or three thousand miles per hour, heaven only knows!

As for the tides, well, let's leave the tides to be worked out by more scientific readers. Of course, it may be that in speeding up rotation, and thus reducing the period of daylight (and darkness) the effect of the sun in creating winds might be reduced. The sun would have less time to heat up the masses of air and water, and this might cancel out the effect of the increased differential speed between the Polar and equatorial atmospheres. Similarly with the tides, although the main force here is gravitational.

If it proved possible to speed up or retard the earth's rotation in the manner described above, calendar reform would be a simple matter, since the solar day could be correlated to Siderial time—no more Leap Years!

But the most attractive prospects of our new instrument of jet propulsion lie in pointing the jets the other way—i.e., in a north-south direction.

Fig. 5

Fig. 6

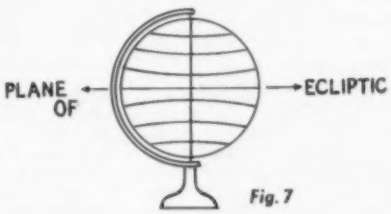


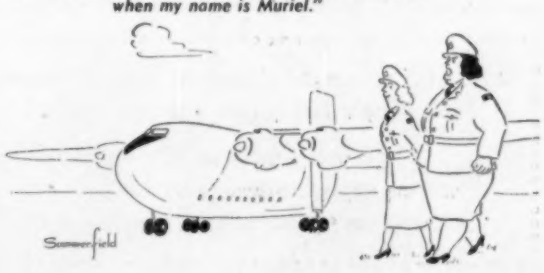
Fig. 7

Speaking personally, I have always taken a dim view of this tilting of the earth's axis to the plane of the ecliptic (Fig. 6). This is the cause of all the trouble, and allows the sun to disappear for a great part of the year, reappearing somewhere about July and August to blister us with sunburn before disappearing again in snow-laden cloud, sleet, and what have you.

Now, all we need to do is to arrange these jets so that they tilt the earth's axis back again to the plane of the ecliptic (Fig. 7). By this means, winter and summer are abolished, and we all live in perpetual springtime, so everybody should be satisfied. Even at the Poles there would never be any hours of darkness. Due to the refraction of the atmosphere, the sun would always appear to be above the horizon all the year round. Not only that, but navigation would be made a lot easier.

All things considered, therefore, I can see no reason why we should not get busy with correcting this tilt, and if that works out all right, we can go ahead with speeding up the rate of rotation. Perpetual springtime, and a three-hour working day, are two things to which I eagerly look forward. H.T.

"I can't understand why he always calls me Beverley when my name is Muriel."



PUT HORROR COMICS OUT OF SIGHT
FOR CHRISTMAS BRINGS YOU . . .

JUNIOR FLIGHT and AIRCRAFT APPRENTICE

TODAY'S FORECAST: Weather FRIDAY, 24th DECEMBER 1954

TRAPPED IN TAILPIPE BLAZE

Bystanders stand by as crash crews probe mystery jet, seek ignited spotter

HIS many fellow-spotters will be grieved, if not delighted, to hear of the recent accident to Junior Flight's serials and registrations correspondent, William ("Hawkeye") Brown.

"Hawkeye" met his untimely end while performing a technical appraisal of the second prototype Grudgingly Graunch [VZ999, modified pilots-step recess cover mounting-plate label—Ed.] at Ditching-in-the-Drink, its home airfield, last Monday.

A Grudgingly spokesman gives this eye-witness account of the tragedy: "Brown's first action was to copy out in detail all external markings on the Graunch. He then counted all the rivets and—a master touch, this—measured the actual size of roundels, serial numbers and auxiliary jacking-point indicator strips.

Danger!

"Hawkeye next expressed a natural wish to obtain the part-numbers of all turbine-blades fitted to the Graunch's massive Ghoul turbojet [a J-lol-P4A-72H/14, works No. 7½, delivering 324.5 lb thrust—Ed.].

"Bystanders pointed out the danger of climbing up the narrow tailpipe [mean bore, 13.37in—Ed.] ("mean bore yourself," Grudgingly spokesman).

"Despite their advice, Brown was consumed by curiosity and," the spokesman added laughingly, "a 20ft flame, for, unfortunately, a mechanic chose this very moment to start up the Ghoul."

Those who remain to carry on Hawkeye's work at least have the consolation of knowing that, in accordance with his dearest wish, his ashes were scattered along the longest runway in England [11,473ft, under I.C.A.N. conditions, including paved overrun—Ed.].

Vacuum!

Many tributes have been paid to Hawkeye. The Editor of *Junior Flight* [that's me—Ed.] writes: "His passing leaves a gap in our ranks which will not be filled for at least two weeks, the Situations Vacant columns having closed for press."

★ Regular readers will remember, since we are reminding them now, that Brown was to have delivered the Fifth Commonroom and Playground Lecture to the Junior Aeronautical Society in London next week.

Soviet Secrets!

He had chosen for his subject *Some Aspects of Squadron Markings on Central American Glider-tug Elevator Tabs.* In place of the lecture, members will hold a design symposium on the merits of Russian aircraft created by the fertile imagination of Brown during his period of service as European special-assignments editor of the *Cincinatti Skyman, incorporating Junior Jet Jockey.*

STRATOSPHERIC NEWSHAWK. Junior Flight's Editor, seen before flying the Yodel Bye-bye (French ultra-light spaceship). How does it feel? His exciting story—"Bye-bye in the Air"—will appear next week. DO NOT MISS IT!

Schoolboy Builds Sportsplane

A NEWPORT PAGNELL boy who laughingly admits he cannot pass exams has just built his own sportsplane.

He is Henry Kogg, 9½, red-faced, amiable possessor of Airline Transport Pilot's Licence No. 1 and three grey spaniels. Schoolboy Henry says "I read a lot of technical books and spent hours going through aviation magazines. They were absolutely useless."

Asked how, so young, he has A.L.T.P. Licence No. 1, pilot Kogg smiled unpleasantly: "My father doesn't work for the M.T.C.A. for nothing, you know." He added, smirkingly, "Almost for nothing though, until the recent payrise."

Special feature of the new plane, *Junior Flight* can reveal, is the revolutionary undercarriage, the Koggwheel, about which nothing can be revealed.

ANSWER to puzzle picture of Auntie Bonnie and Auntie Helen (see opposite page).

Should land plane on wheels, not nose.
Should not sit on cowling during landing.
Should not sit on strut, either.

AEROPOSTBAG

Uncle Ken's Korner

SUM FATHER . . .

My father does stressing sums all day, but won't give me an electronic calculator for my birthday.

Richard Gapes (7½)

—Dad's obviously not a yesman stressman, eh, Richard?

HIS OWN HEIRCRAFT

I started building an aeroplane for my son 23 years ago. Guess what type it is?

Theodore Grubb (46)

—Sounds to us like an ultra-late, Mr. Grubb!

FIRE AWAY!

My Mum always pinches my copy of Junior Flight. She says it's excellent for lighting the fires.

John Fishball (4¼)

—Ha! Ha! Hot news I suppose, eh, John?

AUSTERALIAN VIEWPOINT

I live in Melbourne. My Uncle came from England, but left his Auster Autocar there. What do you think of this?

Peter Roadworthy (9)

—He autocar-ried it with him, eh, Peter?

TRY THIS ON DAD!

Is it true that, when the complementary energy of a homogeneous body with arbitrary elastic properties is expressed in terms of the components of the Maxwell-Morera tensor, the Euler equations for the integral of the complementary energy density form the complete set of compatibility equations in terms of the stress components?

Andrew Ignottz (8¼)

—Which particular stress components had you in mind, Andrew?

★Now turn to Brief Beefs, p. 3

HELICOPPERS COP FLYAWAY AIRTHIEF

Downdraft Leads to Downfall as Surrey Housewives Scream

By Junior Flight Reporter

East Grinstead, Thursday

"I BLAME gravity," 15-year - old Rodney J. Therblig, convicted woman-thief, told me in his cell here today. Daredevil Therblig, who yesterday attempted to kidnap Miss Tunbridge Wells 1954 in his specially equipped Tiger Moth plane, had been foiled by the vigilance of the Surrey constabulary (Air Division), who used their new patrol-copters with devastating effect.

Chased by whirlycops in a 90-m.p.h. dash above Surrey rooftops, Pilot Therblig repeatedly pointed nose of Tiger up cloudwards, repeatedly lost airspeed, fell earthward. "Quit stallin', Therblig," advised the eggbeater patrolmen over the R.T.

Soon their chance came. As Therblig battled with 90-m.p.h. headwinds, the rotacops climbed above him, used downdraft from mighty rotors to force Tiger earthwards once more.

Final touchdown made in local sewage farm, Therblig later obeyed police injunction to come clean.

OUR FLYING PET this week is air-dog Domino. Looking after Domino is 16-months-old Christopher. Looking after Christopher is B.O.A.C. receptionist Miss Edgecombe. Looking after Miss Edgecombe is —— Here, I say, chaps, fetch the Editor back!

PUZZLE PICTURE: Guess what is wrong in this picture of Auntie Bonnie and Auntie Helen. (Answer: Opposite page, Col. 1.)

Expert Phisbee says No!

—to underground heliports

SHOULD London's airstops be located underground? "No!" is the forthright answer of young Dr. Phisbee Z. McGillicuddy, 19, affable, balding president of the Junior Aerothoughtical Society. Speaking to a top-line, top-hole group of the airplane industry's back-door boys in Swanage last night, he gave the following reasons for this remarkable point of view:—

1. Optimum helistation size varies as subsoil stability, making intercity facilitation improbable.
2. Congestion would increase with railway stations, bridges, air terminals built above helistops.
3. The noise problem: complaints inevitable from underground train travellers.

RAY DOME (ACE OF SPACE) — ON THE PLANET ZUNK
RAY DOME, ACE OF SPACE, TOGETHER WITH HIS SPACE KNIGHTS OF THE ROUND HEADS, MAROONED ON THE ALPHA-PARTICLE ISLAND IN THE GREEN MERCURY SEA OF ZUNK HAVE BEEN UNABLE TO MOVE SINCE LAST WEEK'S INSTALMENT.
MEANWHILE ON NEIGHBOUR PLANET OGOS....
SILENCE! SUMMON MY VITAJET!
OH KRETIN! THE KLANGS REVOLT! ALREADY THE MOOLONIUM RAY PLANT IS TAKEN!
NOW FOR ZUNK! LET US SEEK RAY DOME HIMSELF
HAVING ESCAPED FROM THE GREEN MERCURY SEA AND RELEASED THE LOYAL PLEBS, DOME MEETS KRETIN IN THE CITADEL OF ZUNK...
WE NEED YOU DOME. THE KLANGS ARISE LED BY NAURON!
TOO LATE KRETIN - THOSE ARE KLANGER ROTASAUCERS. SWITCH ON THE UNILUNAR GLUCODEXTROLYSER RAY-BEAMS!
BUT ON THE ALPHASCREEN, DISASTER!
YE GODS! THE KLODS HAVE KIDNAPPED LORNA. QUICKLY! OUR LEVITABELTS!
SPLAT
OUCH!
DEATH TO ALL KLANGS!
TAKES THAT KRETIN
AAARRGH
....
NEXT WEEK ANNIHILATION!

Oh Boy! Still more for your delight, for here's page 3 of ...

JUNIOR FLIGHT

KEEN TYPES! Junior Flight experts on duty, wearing the latest Zebra-hide Bonedomes, each with its Vertical-Risor-Visor.

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I.C.A.O. (contd.) . . .

delay. However, that facilities for the rapid transit of messages between positions of locally situated units and offices mentioned in the proceeding recommendation should permit extension to positions or offices of aircraft operating agencies, and that conditions concerning provision of the latter facilities should be a matter for arrangement between the State and the aircraft operating agencies concerned, unless arrangements exist whereby such information may be made available to them by other means, notwithstanding any retro-active preference for non-typing reperforators. The sums mentioned in francs in this article refer to a currency unit consisting of 65½ milligrams of gold of milesimal fineness 900.

(To be continued)

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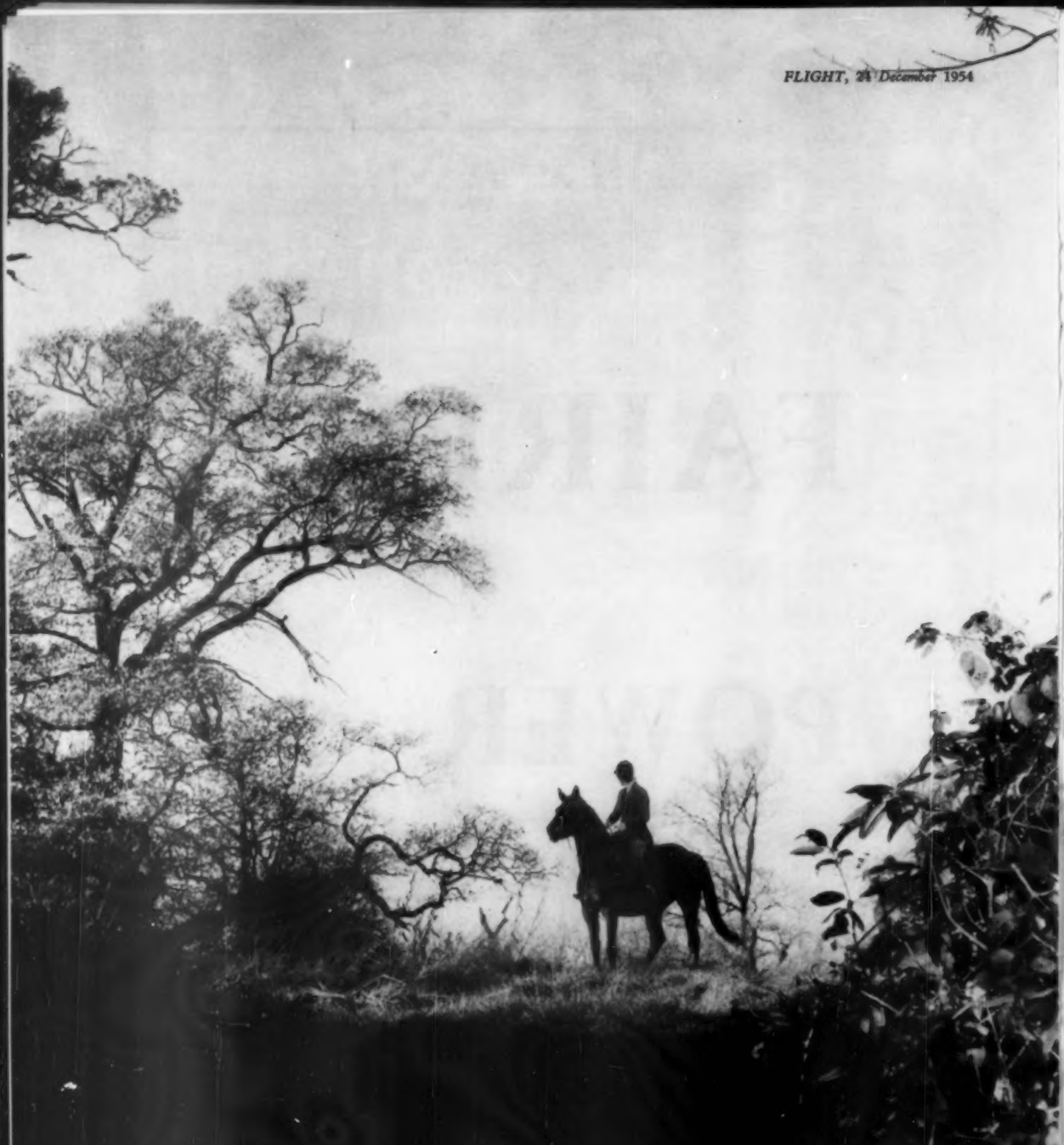


Wishing a Merry Christmas and a Happy and Prosperous New Year to friends throughout the world

DE HAVILLAND

THE ADVENTURE OF THE BOOTH-NICHOLSON DIPSODYNE

AS SET DOWN BY

John H. Watson, M.D.

ILLUSTRATED BY PENNAN BRUSHE

CHAPTER I

AN OPEN FACE

I OBSERVE, on referring to my notes, that on a summer morning at the turn of the century I found myself ensconced by a blazing fire in the lodgings of my friend Sherlock Holmes. As a prophylactic against my companion's insalubrious fourpenny shag I had lit up a brace of Indian cheroots, but obtaining scant relief therefrom, had determined to fall into a brown study. I was, indeed, thus occupied when Holmes' incisive tones cut through the pall of burning weed.

"My dear Watson," he enjoined with some asperity, "do you now be a good fellow and deliver up my box of wax vestas which I perceive you have absent - mindedly secreted in your fob. Then lay me under a further obligation by admitting the diffident caller who, if I am not mistaken, has been haunting our threshold these eight and twenty minutes."

I groped my way to the door and flung it open to disclose a fellow of some five and forty summers. He had a military bearing, though he seemed civil enough, and his open face prompted me to proffer him my cigar case, which he accepted eagerly and slipped into a pocket of his serviceable pea-jacket.

I was motioning our visitor toward the ottoman when his eyelids developed a flutter. From his attitude I judged that he was under pressure, overloaded and generally out of trim. Tension and fatigue had wrinkled his skin, and he was pitifully unstable, pitching and rolling as he approached the limit of his endurance. Turbulence and shock had done their work and in a trice the hapless fellow had gone completely out of control and spun flat to the floor.

Holmes was on his feet in an instant. "I shall so remain on his feet, good Watson," he declared, "until such time as you shall have rallied him with a whiff of *sal volatile*."

"I HAD LIT UP A BRACE OF INDIAN CHEROOTS"

Though aware that Holmes' chemical closet was but a step across the landing, I hastily seized the gasogene, and directed the contents squarely into the fellow's open face.

CHAPTER II

A MAN OF SPIRIT

The effect of my action was salutary enough, though a tonic was evidently the one thing needful.

"My family . . ." our visitor began.

". . . are the Booth-Nicholsons of Plymouth," broke in Holmes, "and if I am not mistaken, I have the honour to address Sir Gordon Booth - Nicholson — or a double."

Our visitor started, though

not, I was relieved to note, before Holmes had concluded.

"I am presently occupied," he went on, "in the drawing up of a tender for a locomotive aerial carriage, which may be familiar to you gentlemen by its mnemonic appellation."

"You allude, I apprehend," said Holmes, "to the Booth - Nicholson Dipsodyne."

Sir Gordon nodded a grim affirmative.

"My delineations," he went on, "I had secreted privily in my chambers at Tite Street. They were deposited in a stout casket of bass wood, and to put it mildly, it was a bitter blow when I found it spirited away.

"I should explain that my design is based upon a follow-through links motion, with sand-blasted angle-iron drive. As for structural principles, I am no novice at the game, and in tackling the forward three-quarters I recognized no half-way line. A high-grade match board obviated any penalty in this area.

"The most revolutionary of my manifold innovations, however, affected the prime mover. I had been experimenting—and here I must enjoin you to the strictest secrecy — with a bi-fuel system, the constituents being methylated spirit and wood alcohol. After over-proof tests the engine displayed a marked reluctance to start up, though it had been well oiled on the previous evening. The throat of the carburetter was furred, the impeller eye near-closed, and a hammer-like throbbing could be discerned in the cylinder head.

"Need I add, Dr. Watson, that a simple analgesic, which you will permit me not to specify, quickly put matters to rights; but though elementary in itself, the remedy is of such efficacy as to represent a potential national asset of the first importance, for nothing is more certain than the eventual recourse to alcohol of our country's engine-designers."

"The moment of this affair," said Holmes at length, "does not entirely elude me; indeed, Sir Gordon, my little monograph 'Fluid Motion Round a Supine Body' may have come to your notice. Nor am I unmindful that the Booth-Nicholson method of obtaining lift is fully endorsed by Curtis.

"HE PAUSED AT A RUDE SIGN"

"Such, indeed, is the import of the business that it behoves us to move with celerity. But do you compose yourself, Sir Gordon, for though I perceive this to be a case of the most bold-faced type, you may depend upon it that those at the fount shall be brought to book."

"You imply . . ." Sir Gordon faltered.

"The faculties of deduction and logical synthesis, which I have made my special province, lead me to affirm," rejoined Holmes with distasteful relish, "that we are pitted against the most fiendishly clever elements of the technical press."

CHAPTER III

BLACKFRIARS, S.E.1

"You will confer a great favour upon me, my dear Watson," said Holmes, when our unhappy guest was sufficiently recovered from his shock to send for a brougham, "by bearing me company on a brief excursion. And do you bring with you," he added, "your very excellent field glasses, for I warrant we shall find them of service." With that he slipped a heavy-calibre, nickel-plated field-flask into a pocket of his ulster.

My friend snatched a plain but wholesome repast of laudanum and long-cut Cavendish which the good Mrs. Hudson set before him, and by noon our four-wheeler was setting off down Baker Street at a spanking pace. By sundown we had attained the south-eastern precincts of the metropolis, and before midnight struck we found ourselves among the noisome alleys of Blackfriars. Holmes surveyed the grimy wharves and mean publishing houses with disgust, and an involuntary shudder ran through his spare frame, which he had taken to bringing on our excursions as a matter of prudence.

As the four-wheeler drew to a halt under a guttering gaslight, a journalist of the lowest and most technical sort lurched from the shadows. I quickly perceived him to be a fellow of singular duplicity, for though far gone in liquor, he was soberly clad in the shiny serge of his calling.

"I SOMEHOW FORCED A GLANCE"

"At this juncture it will indubitably become us, my dear Watson," said Holmes, "to follow that fellow's suit."

CHAPTER IV

DR. MAURIARTY

A thin drizzle was falling, and our quarry turned into a squalid sink of corruption. He paused at a rude sign, whereupon Holmes dropped his hand to my shoulder. "This is a tight corner, Watson," he whispered, "but you are a stout fellow, so do you force onwards into this sty and I shall bring up your rear."

The walls of the den were hung with the roughest of proofs and printers' slips of the most scurrilous kind. A venerable rascal sidled towards us, drawing from his greasy frock-coat a packet of daguerreotypes, which he insinuated into my hand with a toothless leer. "As a sportsman and man-of-the-world," he wheezed, "the doctor will give me the pleasure of examining these newest expressions of my art." Nauseated, I somehow forced a glance at the package and, glimpsing the inscription "Shorts at Shellbeach," thrust them back into the fellow's claw with a cry of revulsion. "Something, perhaps, of a more technical character may take the doctor's fancy," he persisted, pressing upon me a sheaf of electrotypes, with the label: "Behind the Scenes at Maxim's"—a monstrous example to four mere striplings whom I suddenly perceived to be touching their forelocks in the most abject servility.

Cowing them thus was a blond bull of a man—a pink-cheeked, blue-jowled blackguard who whitened visibly as Holmes's voice rang out: "By heaven, Mauriarty! From the start I glimpsed your crimson hands behind these puppets. It was your mounting ambition that led you to make off with the Otto cycle; then your soaring vanity emboldened you to publish your scandalous impressions of Dumont's *demoiselle*. But from the secrets of the Dipsodyne you shall never tear the veil."

"At him, Watson," he cried; but even as I lunged forward with my stout Penang lawyer, the master criminal whipped a bulky object from beneath his cloak, and sent it crashing through the dingy skylight without so much as loosening his hold.

There was a double splash in the blackness of the river, and on the night tide bobbed a casket of bass wood and a ticket to North Carolina.

AIRCRAFT INTELLIGENCE

"Flight" photograph

The prototype Hunting Percival Jet Provost is now at Boscombe Down, where it is being "wrung out" in the approved fashion. The company's works at Luton are still in full production with the Provost T.1, with well over 300 already delivered to the R.A.F. and overseas air forces, and a number of additional Jet Provost prototypes are approaching completion.

Great Britain

Avro Shackleton M.R.3. Very considerable redesign has been effected in this new mark of Shackleton, largely with a view to increasing crew efficiency, although the aircraft will also be improved from several other aspects. The principal superficial change is the adoption of a tricycle undercarriage with double wheels throughout. When details were released last summer it was stated (not by Avro) that the prototype Mk 3 would be at this year's S.B.A.C. show; in fact, there is no prototype in the normal sense, for the first machine is being built in production jigs and is being immediately followed by all the other aircraft now on order for Coastal Command and the South African Air Force. The work on the Shackleton 3 line is progressing steadily, and it is expected that the first machine will be finished by the late spring, and that all contractors and Boscombe trials will have been successfully completed by the summer.

U.S.A.

Grumman F9F-9 Tiger. In the past we have refrained from publishing a three-view general-arrangement drawing unless the dimensions of the aircraft were known to us. On this page an exception is made in the case of the Tiger in view of the fact that, although dimensions are still withheld (as they are also for the Grumman S2F and Cougar), an accurate drawing can be prepared. Enormous quantities of Tigers will be available to the U.S. Navy during 1956-7; various sub-types are now being projected, the basic machine being a level-sonic carrier-based day intercepter.

Monocoupe Meteor. The latest example of the twin-engined, all-metal, American private-owner machine is the Monocoupe Meteor, designed to cruise at 180 m.p.h. at 70 per cent of the power of two 150 h.p. Lycomings. The entire fuel load of 70 gallons is carried in wing-tip tanks, giving a range of 850 miles. Gross weight is 3,100 lb, and initial rate of climb 1,950ft/min.

North American TF-86. A photograph of the standardized two-seat trainer variant of the F-86F Sabre was published in our issue of September 3rd last. This aircraft, now on widespread demonstration tours, can be fitted as a gunnery trainer with two 0.50in guns and A-4 sight with AN/APG-30 radar. This equipment comes in kit form, as does underwing stores-provision for such loads as eight 5in rockets or two 200-U.S. gallon drop tanks. With the latter in place the endurance is better than two hours at low altitude, making possible about 20 standard circuits in succession. The tanks reduce the combat speed of the trainer to 497 knots (M=0.865) at 35,000ft; clean, 531 knots (M=0.921) is possible. At sea level, the TF-86 is good for 533 knots (M=0.808).

Piasecki YH-16. The present Pratt and Whitney R-2180 Double Wasp piston engines of this 30,000 lb U.S.A. helicopter are to be removed and replaced by two Allison shaft-turbine engines. The YH-16 has already exceeded 130 m.p.h. and has flown at 3,000ft.

France

Breguet Deux-Ponts. Experiments just concluded with this double-decked freighter show that 164 men or trucks, field guns, fuel containers and ammunition up to a limit of 17.2 metric tons, can be carried over a distance of 745 miles "with a margin for safety". On the last flight of a recent series of trials the load was a 14-ton tank.

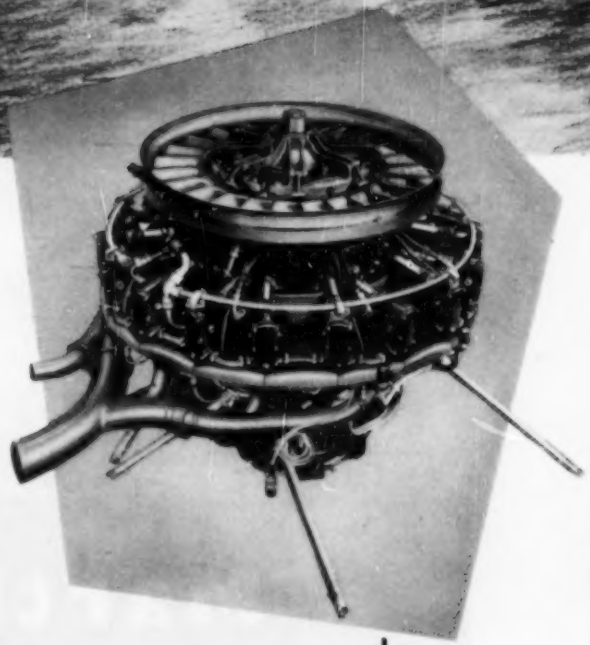
Twin-Dart Transport. Official bodies in France have discussed with operators "the problem of a twin-engined passenger aircraft for short distances" powered by Rolls-Royce Darts. The assembly heard representatives of Hurel-Dubois and S.N.C.A.N., both of which companies have projects under study at the moment.

Spain

Aerotecnica AC-13. It is reported that several prototype piston-engined, hub-driven helicopters are being built by Aerotecnica, the example with the designation quoted being similar to the Bell 47. The only unorthodox feature of the aircraft appears to be at the tail end, where a pair of small fins are fitted on a framework mounted at the tip of the tail boom. There is no sign of an anti-torque tail rotor.

Hispano Suiza. This famous company, who have manufactured piston-engined training aircraft of their own design for many years, are now building the prototype of a twin-jet advanced trainer. The engines are reported to be Turboméca units (either the Palas or the Marbore) and they are mounted in the roots of the wing. A single-seat fighter version is stated to be projected.

Adaptability



The ALVIS LEONIDES Helicopter Engine as installed in the Bristol 171 Sycamores of the Royal Australian Navy has proved its adaptability to both civil and military operations. 520 b.h.p. 9-cylinder air-cooled radial engine. Weight complete 645 lb. Power/weight ratio 1·24 lb. per b.h.p. Overall diameter 41·5 inches.

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This astonishing feat was made possible by the employment of two stabilising drogues in tandem, designed to reduce, with acceptable deceleration, the speed of the seat after ejection and then to control the main deployment of the parachute thus eliminating the explosive opening characteristic. This seat was also fitted with the Martin-Baker Patent Barostatically Controlled Time Release Mechanism and Drogue Gun.

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THE SUPERSONIC FIGHTER

PART 3

By J. W. FOZARD, D.C.Ae., B.Sc. (Hons), Grad. R.Ae.S.

PARTS one and two of these articles have considered the aerodynamic refinements necessary to achieve low drag and have dealt with the characteristics of possible types of powerplant. It is the purpose of this concluding article to combine the thrust and the drag and thus to show the probable performance characteristics of the supersonic fighter.

6.0 Performance

6.1 Thrust and Drag. The basis for the discussion is Fig. 15, which shows the relative proportions of thrust and drag over the speed and altitude range. The reader should note in particular the effect of the reduction in air density on the slopes of the drag and thrust curves as altitude is increased, and the "parallel" characteristics of the thrust and drag at medium and high altitudes. The top speed of the aircraft at any altitude is the speed at which the thrust and the drag are equal. It can be seen from Fig. 15 that the top speed initially increases with altitude, reaching a maximum in the vicinity of the tropopause, and then decreases with further increase of altitude to the ceiling of the machine. The magnitude of the transonic "hump" in the drag curve at altitudes near the ceiling is of particular significance, as is demonstrated by the inset curve of Fig. 15. At these altitudes the aircraft has two distinct ranges of speed in which level flight is possible, the one largely subsonic and the other wholly supersonic.

6.2 Level-flight Boundary. Fig. 16 shows the level-flight boundary typical of the supersonic fighter. Note the twin peaks at high altitude caused by the type of drag curve shown in the inset of Fig. 15. The importance of achieving the minimum transonic drag will be appreciated in the light of this peculiarity. If the aircraft has a relatively large drag in the transonic region (due, say, to a bad wing/body junction causing severe interference) the twin peaks in the level-flight boundary become more pronounced and the "valley" between them becomes wider and extends to much lower altitudes. Such characteristics place undue restriction on the high-altitude performance of the machine, since the aircraft cannot then accelerate in level flight from subsonic to supersonic speed, but is forced to achieve this transition in a dive. Thus the designer must strive for the minimum transonic drag in addition to seeking to reduce the drag at high supersonic speeds. If, by some chance, the transonic drag becomes particularly large, the aircraft will degenerate into a transonic-type fighter whose thrust-drag intersections occur in the transonic region (Fig. 1c).

With normal wing loadings (*circa* 50 lb/sq ft) it is likely that the subsonic high-altitude peak in the level-flight thrust boundary will be cut off to some greater or lesser extent, as shown by the line marked "stall limit" on Fig. 16. Due to the relatively low C_{Lmax} of the supersonic type of wing at transonic speeds, the level-flight 1g stalling speed will occur in the transonic region near the ceiling of the supersonic fighter. Further to emphasize this stall restriction, Fig. 17 shows the level-flight stalling speed (in terms of Mach number) over a range of altitude for a series of values of C_{Lmax}. The dotted line running across the C_{Lmax} lines may be regarded as a typical variation of C_{Lmax} with M for the wing of a supersonic fighter.

6.3 Excess Power Characteristics. Other things being equal, the manœuvrability of an aircraft at a particular speed and altitude is directly proportional to the excess power available at those flight conditions. At the top speed, all the engine power is being used to overcome the level-flight drag; but at lower speeds than this (with the engine still running at full throttle) there is an excess of thrust over drag. This excess thrust can be used to overcome the additional drag due to manœuvring, or to do work against the weight of the aircraft in climbing, or to accelerate the mass of the machine to higher speeds.

If, at a particular altitude, we convert the drag and the thrust into horsepower (by factoring the values by $V_{fps}/550$) we obtain the type of curve shown in Fig. 18. The excess horsepower, i.e., the difference between the thrust h.p. and the drag h.p., can then be replotted as shown in the inset curve of Fig. 18. The characteristic thus obtained exhibits two peaks of excess power, the one at subsonic speed and the other well into the supersonic range. These two maxima signify that there are two distinct speeds at which a maximum manœuvring potential is achieved. In particular, since climbing is merely a specific type of manœuvre, the twin peaks of excess power mean that the supersonic aircraft has two optimum climbing speeds. The relative magnitude of these excess-power peaks, and their position in the speed range, will change with altitude, and so the optimum climbing speeds will vary as the climb proceeds. Fig. 19 shows the variation of the excess-power curves with altitude and indicates the variation of the optimum subsonic and supersonic climbing Mach number with increase of altitude. The numerical magnitude of the excess-power peaks will be appreciated when it is realized that an excess *thrust* of 1,000 lb represents an excess *horsepower* of 2,000 at high subsonic speed, and an excess power of 4,000 h.p. at approximately M = 2.0. Thus, for an aircraft weighing 25,000 lb, every 1,000 lb of excess thrust will endow a rate of climb of over 2,500 ft/min at a high subsonic climb speed, and will yield a rate of climb of approximately 5,000 ft/min at a climbing Mach number of approximately 2.0.

6.4 Climb. Compared with the simple climb technique of the subsonic fighter, the possible climb paths of the supersonic fighter are very complex. They are critically dependent on the excess-power characteristics of the aircraft, and the optimum climb technique in a particular case is governed primarily by the speed and altitude at which the fighter is required to terminate the climb. The simplest case is that of a "patrol" climb from s.l. terminating at cruise altitude and speed. In this manœuvre the aircraft will take off and accelerate in level flight at very low altitude to the best subsonic climb speed. The pilot will then ease back the stick and enter the climb, the variation of climbing Mach number with altitude being the subsonic climb path shown in the inset of Fig. 19. The variation of rate of climb and time to height resulting from this technique is shown in Fig. 20.

This subsonic climb, in all respects, is directly comparable with the combat climb of existing subsonic fighters. The combat climb of the supersonic fighter, however, with its emphasis on the minimum elapsed time to extreme altitude, will necessitate a climb technique which can take advantage of the fantastic excess powers available at supersonic speed. Fig. 20 shows the variation of rate of climb with altitude for the supersonic climb path given in

Fig. 15. Thrust and drag, typical supersonic fighter, level flight.

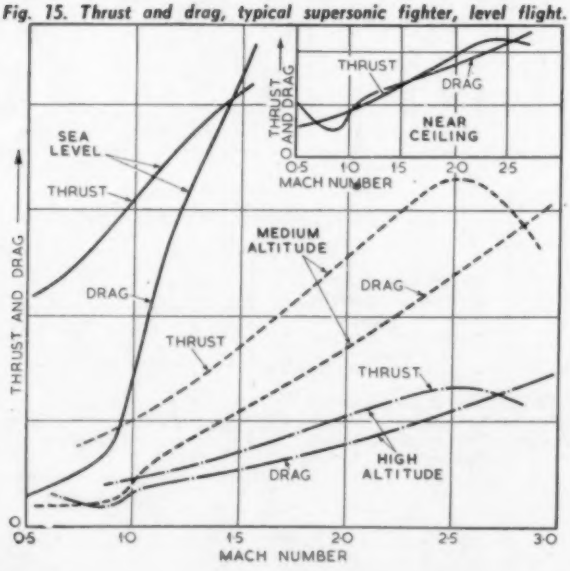
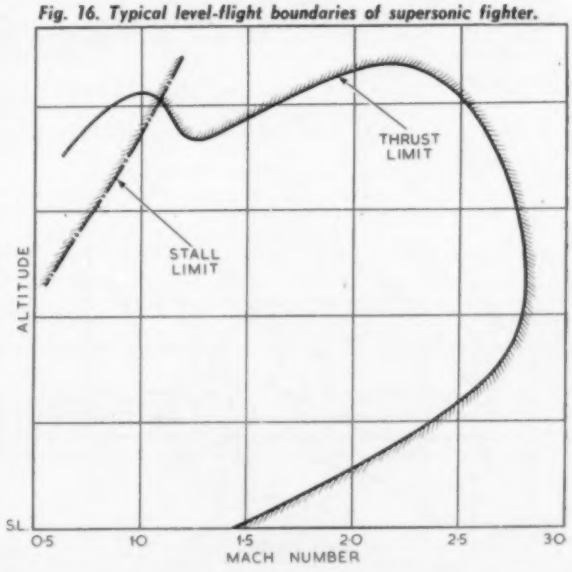


Fig. 16. Typical level-flight boundaries of supersonic fighter.



THE SUPERSONIC FIGHTER . . .

Fig. 19 (inset). Compared with the subsonic climb, the rate of climb at medium and high altitude is vastly superior but, due to the variation of the excess power characteristics with altitude, this climb path cannot start from supersonic speeds at sea level. This particular phenomenon is not fundamental to all supersonic fighters; for example, an aircraft with a very high wing-loading and a very high power-loading would exhibit the two distinct optimum climbing speeds (the one subsonic and the other supersonic) at all altitudes from s.l. up to its ceiling. However, for the moderate-wing-loading type of supersonic fighter, to which the present characteristics apply, there is only the one (subsonic) optimum climbing speed at low altitude. The particular method of stepping from this subsonic climb at low altitude to the supersonic climb path at medium altitude is the major problem of the supersonic climb techniques.

The acceleration from subsonic to supersonic climb speed can be accomplished either by accelerating during the climb or by climbing at subsonic speed to a chosen altitude, accelerating in level flight at that altitude, and then proceeding along the supersonic climb path. Fig. 20 shows the time-to-height curve resulting from this latter "stepped climb" technique. It will be noted that, although time apparently is "wasted" during the period of level flight acceleration, the phenomenal rates of climb realized when the supersonic climb speed has been reached result in a much-reduced total elapsed time to extreme altitude compared with the subsonic climb.

The optimum climb procedure in a given case is very much dependent on the excess-power characteristics of the individual type of aircraft, and further discussion of the problem in general terms can serve no useful purpose. The use of "energy" techniques greatly facilitates the determination of the optimum climb path once the excess-power characteristics have been evaluated. A discussion of this method is beyond the scope of this paper and readers are referred to an article by E. S. Rutowski in the *Journal* of the I.Ae.S. (U.S.A.) for March 1954.

6.5 Turning Performance. The usual form of the excess-power characteristics of the supersonic fighter is also reflected in the turning performance of the aircraft. Fig. 21 shows the variation of the maximum normal acceleration which can be held in a sustained turn at constant altitude. The two speeds at which maximum g occurs correspond to the two peaks of excess power noted earlier. In this particular aspect of performance, however, account must be taken of radius of turn and rate of turn in addition to the normal acceleration. Fortunately, all these related variables can be plotted on a single graph such as Fig. 22, which compares the steady turning performance of a supersonic fighter with that of a subsonic fighter. The curves show the full-power manœuvre boundaries of the aircraft; i.e., the maximum sustained turn which can be achieved at max. r.p.m. without loss of either speed or altitude. Both machines achieve their maximum rate of turn at subsonic speed, but beyond M_{crit} the manœuvrability of the subsonic fighter is curtailed very abruptly, due to its steep drag rise. The supersonic fighter is shown to be capable of sustaining a 3 g turn at M = 2.2 compared with 2.5 g at M = 0.9, but this higher value of g is associated with a lower *rate* of turn and a very large increase in turning *radius*. Turning radii of the order of ten miles are typical of manœuvres carried out at high supersonic speed, and for this reason it is to be expected that the "dog-fight," so characteristic of the fighter-*v*-fighter type of combat, will become extinct with the advent of the supersonic fighter. Even the fighter-*v*-bomber duel will have to be precisely carried out, utilizing the resources of ground control and long-range airborne radar, if successful interceptions are to be accomplished under the conditions of large-radius turns at extreme altitudes.

6.6 Take-off and Landing. The low L/D ratios which are characteristic of supersonic flight mean, as has been demonstrated earlier, that the powerplant weight as a proportion of the aircraft weight will be larger than for existing subsonic fighters. This implies a large excess of thrust at subsonic speeds, and the thrust-to-weight ratio will be such that the take-off problem on the

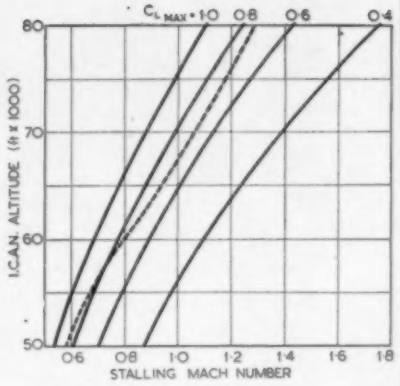


Fig. 17. Variation of 1g stalling speed with $C_{L\,max}$ at extreme altitude (wing loading, 50 lb/sq ft). Dotted line shows typical variation of $C_{L\,max}$ for supersonic fighter.

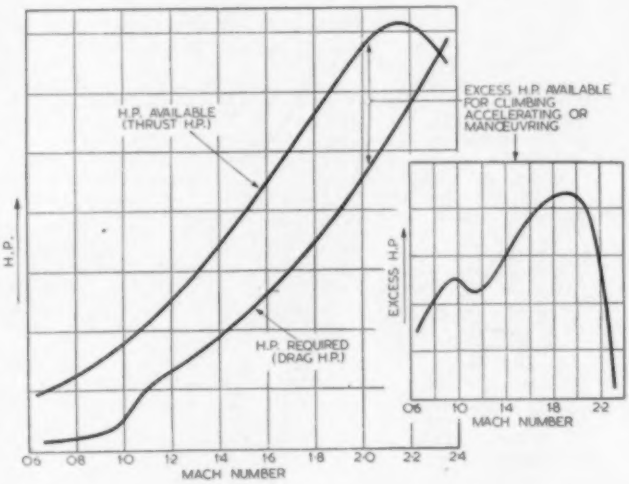

H.P. AVAILABLE (THRUST H.P.)
EXCESS H.P. AVAILABLE FOR CLIMBING, ACCELERATING, OR MANŒUVRING
H.P.
H.P. REQUIRED (DRAG H.P.)
EXCESS H.P.
0·6 1·0 1·4 1·8 2·2
MACH NUMBER
0·6 0·8 1·0 1·2 1·4 1·6 1·8 2·0 2·2 2·4
MACH NUMBER

Fig. 18 (below). Power characteristics of the supersonic fighter in level flight at constant altitude.

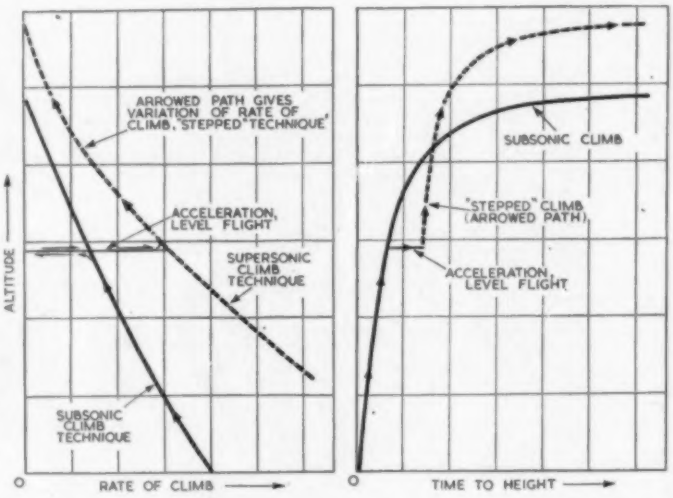


Fig. 20. Climb performance of supersonic fighter.

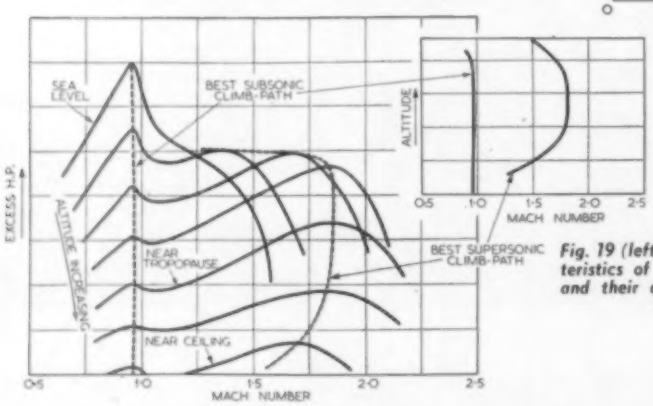


Fig. 19 (left). Excess power characteristics of the supersonic fighter and their effect on the optimum climb-path.

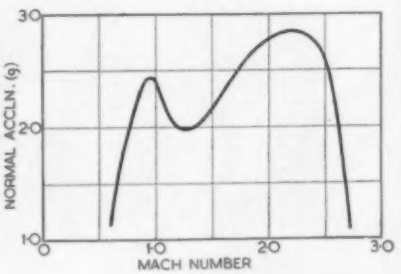


Fig. 21 (right). Manœuvring characteristics of supersonic fighter at constant altitude.

THE SUPERSONIC FIGHTER . . .

supersonic fighter is not likely to be at all serious. With moderate wing-loadings the runway length required should be no greater (in some cases much less) than that required at take-off for the existing subsonic types of fighter. However, due to the relatively low maximum lift coefficient of the supersonic type of wing at low speeds, the supersonic fighter will approach to land, and touch down, at speeds which may be considerably in excess of current landing speeds.

It is for this reason that the use of efficient high-lift devices is likely to become mandatory on the supersonic fighter. The extremely thin wing will prohibit the use of complicated devices such as leading-edge slats and Fowler-type flaps, due to the lack of space in which to stow them and their operating mechanisms. Thus the designer, perforce, will have to adopt relatively simple devices such as plain flaps in conjunction, perhaps, with a drooped leading edge. The aerodynamic efficiency of such devices can be improved considerably by the use of boundary-layer control—the turbojet engine, incidentally, being an ideal power source for applications such as boundary-layer control by suction or blowing. It is important to note that the designer need not strive for very large increments of lift from his flaps, etc. A value of ΔC_L of approximately 0.3 will, for most supersonic wings, raise the landing lift coefficient by over 30 per cent, which increase would result in reductions of approximately 15 per cent and 25 to 30 per cent in the landing speed and landing distance respectively. Due to the high value of thrust-to-weight ratio, particularly at landing weight when most of the large fuel load will have been expended, it would appear that thrust reversal will be of especial benefit on the supersonic fighter. It is probably true to say that such a device would be essential if the supersonic fighter were required to operate from any other than a Class 1 airfield.

6.7 Acceleration Characteristics. As a result of the parallelism of the thrust and drag curves, the supersonic fighter will have an approximately constant acceleration in level flight from speeds just in excess of M = 1.0 up to the maximum speed. The magnitude of the acceleration in terms of g (or ft/sec/sec) will depend on the altitude at which the acceleration takes place. At low altitudes the magnitude of the accelerating force (the excess thrust) may be such as to enable longitudinal accelerations greater than ½ g to be sustained, but at the cost of tremendous fuel consumption. At very high altitudes the excess thrust is small and the resulting acceleration will be low. Thus, although the fuel consumption per unit time is small at high altitude, the total amount of fuel burnt in increasing flight speed from M = 1.0 up to maximum level speed will again be considerable. It can, indeed, be shown that for minimum total fuel consumption and for minimum elapsed time the optimum altitude at which level flight acceleration should be accomplished is at or near the tropopause.

The probable deceleration characteristics of the supersonic fighter are somewhat startling by subsonic standards. At low altitude the L/D ratio in level flight is of a very low order, so that when the aircraft is flying at or near its top speed the drag may be as much as twice the weight of the aircraft. Thus, if the throttle is suddenly closed when flying under these conditions, the drag alone will cause a deceleration of over 2 g. As the speed falls, the retardation will be reduced; even so, at very low altitudes a deceleration from M = 1.5 down to M = 1.0 is likely to be achieved in approximately 10 sec—without recourse to the air-brakes. Even at high altitude, where the L/D ratio is substantially greater, retardations in excess of 0.25 g will be achieved on throttling back when flying at very high speed.

6.8 Dive Characteristics. As an extension of the above considerations on the acceleration characteristics of the supersonic fighter, it is of interest to study the probable diving characteristics of the aircraft. For this purpose a comparison is made below between a supersonic fighter and a typical subsonic fighter. Each aircraft is considered to commence the dive with the engine throttled back, from an altitude near its ceiling.

TABLE III: DIVE CHARACTERISTICS

Characteristic	Subsonic Fighter	Supersonic Fighter
Angle of Dive	30 deg	30 deg
Commencing speed	M = 0.9	M = 2.0
Weight component down flight path	0.5 W	0.5 W
Drag (using L/D from Fig. 8 and neglecting change of induced drag from level flight)	0.1 W	0.25 W
Initial accn. down flight path ...	0.4 g	0.25 g
Initial rate of descent...	26,000ft/min	58,000ft/min

It will be seen from Table III that the supersonic fighter has a lower initial acceleration than the subsonic aircraft, and that its greater rate of descent will carry it more quickly to altitudes where the drag is tending to become greater than the aircraft weight. Consequently, the initial acceleration of the supersonic fighter will rapidly be reduced as the dive proceeds. If the aircraft is held in the dive the drag will build up so that the machine will commence to lose speed, especially if the dive is maintained to very low altitudes. Whilst it is true that in dives commenced from subsonic speed the supersonic fighter will be more "lively" and have a greater and more prolonged acceleration than the subsonic fighter, dives commenced from near the top speed will undoubtedly give the pilot of the supersonic machine the impression that his aircraft is generally more sluggish and reluctant to accelerate than the subsonic fighter diving from speeds near its maximum level speed.

One incidental benefit which may result from these characteristics is that the designer of the supersonic fighter may be able to select a design diving speed (for stressing purposes) which the aircraft is incapable of exceeding, regardless of the angle of dive and of the speed and altitude from which the dive may be started. The tremendous drag generated at high supersonic speeds at the lower altitudes will ensure that the velocity of the aircraft is restricted to values within the limits of the selected structural design speed.

Conclusion

The rapidly expanding field of aeronautics has now entered its second major phase—the era of sustained supersonic flight. The object of this series of articles has been to demonstrate some of the characteristics which the true supersonic aircraft is likely to possess. These characteristics, whilst being somewhat unusual when compared with their more familiar counterparts in subsonic flight, are none the less an inseparable consequence of supersonic speed.

When the transonic region has been conquered there occurs no further relatively sudden natural "barrier" to future progress. The effects of aerodynamic heating, although not to be underestimated, are more gradual in their onset and are thus more easily opposed. During the past decade fighter speeds have risen from 500 m.p.h. to beyond M = 1.0, and the necessity to overcome the special problems encountered in this most difficult high subsonic and transonic region has led to the accumulation of a vast amount of experimental data and experience, and has enabled designers to get the "feel" of the new régime. The problems of supersonic flight, while being no less difficult than the problems of the immediate past, are more amenable to analysis, and it may confidently be expected that the speed range of operational-type aircraft will be extended at an unprecedented rate during the next decade.

It is inevitable that, as the speed range is extended and the operating altitude increased, it will become more and more difficult to evolve a machine which is sufficiently efficient in all aspects at every point within the limits of its very wide band of operation. Due to the extreme difficulty of attaining a satisfactory solution to this fundamental problem, we may expect in the future a wider range of more specialized types of aircraft, each achieving the maximum operational efficiency within its particular band of speed and altitude. The question of how this essential multiplicity of types can be reconciled with our national economy is beyond the scope of this article; but there can be no doubt that such compatibility must be achieved if we are to retain in the future our present position as a major air power.

Acknowledgments. For permission to publish these articles, the author wishes to thank Sir Sydney Camm, C.B.E., F.R.Ae.S., director and chief designer, Hawker Aircraft, Ltd. The views expressed are those of the author and are not necessarily held by the company. The author's thanks are also due to his fellow project engineers at Hawker Aircraft, Ltd.—particularly to Mr. T. S. R. Jordan, B.Sc.—for their valuable advice and objective criticism during the writing of the articles.

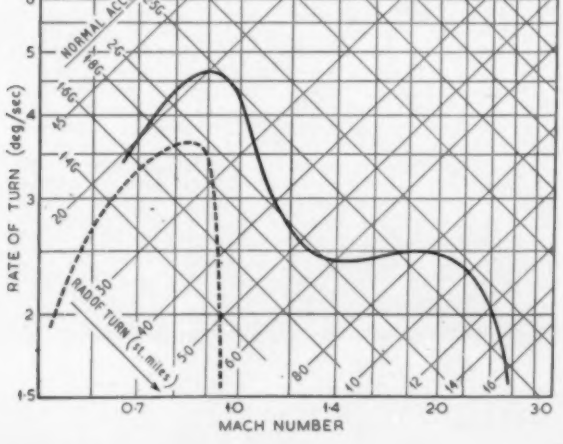


Fig. 22. Steady turning performance (stratosphere). Continuous line indicates steady turning performance of typical supersonic fighter at full power at a constant altitude; broken line denotes corresponding performance of subsonic fighter at full power at a comparable altitude.

HELICOPTER FLIGHT SIMULATORS

Their Claims Discussed at Helicopter Association Meeting

AT the fourth meeting of the Helicopter Association's 1954-55 lecture programme, held in the library of the Royal Aeronautical Society on December 10th, two principal speakers, Mr. Norman Hill and M. Pierre de Guillenchmidt, presented papers to lead an evening's discussion on *The Simplification of Helicopter Pilot Training*. Introducing the two lecturers, the chairman, Dr. G. S. Hislop, said that both were eminently qualified to speak on the subject. Mr. Norman Hill was sales manager of Redifon Ltd., while M. de Guillenchmidt was managing director of Giravions Dorand, a French company which in recent years had carried out a number of extremely interesting experiments to produce a helicopter simulator.

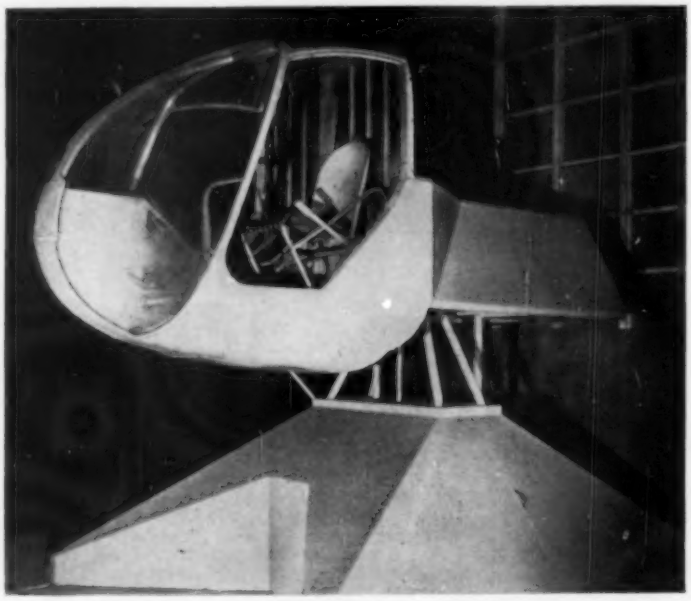
Mr. Hill began by outlining the function of the Stratocruiser and Comet flight-simulators produced by his company. So far as he was aware there had been no developments in the United Kingdom aimed at the production of a helicopter simulator; his part in the proceedings was to show what had been achieved in relation to fixed-wing aircraft in order to stimulate ideas on what could be achieved in relation to helicopters.

The aim of the simulator was to reduce to a minimum the process of flight familiarization, with its attendant potential hazard and cost. By an elaborate system of electronic and electro-mechanical apparatus, almost any navigational problem or emergency condition could be fed into the simulator, and the trainees had to find the correct answer in their handling technique. Apart from normal familiarization, the ability to confront the trainee crew with abnormal contingencies prepared them for an emergency which they might, otherwise, have to face on the one all-important occasion.

After giving a technical description of Redifon simulators, Mr. Hill went on to draw comparisons between the cost of operations with the flight simulator and with the actual aircraft, showing that the simulator training could be carried out for less than one-tenth of the cost of flying training in the air. [The cost figures, which had been compiled with the assistance of de Havilland and Redifon, are reproduced on the opposite page.] Mr. Hill concluded by saying that it had been shown in practice that if a flight simulator was utilized only for the regular six-monthly crew checks, it would pay for its first cost in two years.

An excellent film was then shown to the meeting, portraying the Redifon Comet simulator in action with a trainee crew. A long-distance navigation exercise was carried out, from start-up to shut-down after landing, including a number of emergency procedures which were fed into the system by the instructor.

M. de Guillenchmidt then presented his contribution, which described the activities and experiences of his company, Giravions Dorand, in the production of helicopter simulators. In France, the problem of training helicopter pilots had, in recent years, begun to be felt more fully. Owing to the fact that helicopter flying and maintenance were extremely expensive and that helicopters were more difficult to fly than comparable fixed-wing types, the value of flight simulators was becoming more apparent.



DX.50 helicopter simulator. A single pilot's seat only is shown in this photograph, but dual controls have since been fitted.

Control panel for DX.50 helicopter simulator.

In the case of basic flight training, a large proportion of instructional time was spent in teaching the correct technique for hovering. Stick movements during hovering often appeared to be illogical, and it was in this stage that fixed-wing pilots had to "unlearn" a number of habits which, acquired in aeroplane flying, were unsuited to rotating-wing aircraft. This training phase was altogether different from the corresponding phase for fixed-wing aircraft, and the use of a ground simulator was most valuable.

As an example of the machine's efficiency, he cited the case of one of his company's engineers who, although a glider pilot, had never previously been in a helicopter. After about 20 hours of training in the DX.50 simulator, during which time the characteristics of the Bell 47, Sikorsky S-55, and two French prototype helicopters were introduced into the computing system, he tried his hand on the actual machines. In each case the engineer had been able to master the helicopter in hovering flight after only a few minutes at the controls—much to the surprise of the instructor.

The DX.50 simulator comprised a cockpit, representing an S.N.C.A.S.E. helicopter, mounted on a pedestal and having freedom of movement about its pitching and rolling axes. Movement of the cockpit was actuated by two split-field A.C. motors controlled electronically by power servos. Dual flight-controls were provided, each pilot's position having a control column and collective-pitch lever, the latter being used to start or switch off the simulation. The rudder pedals were locked, as provision had not, up to that time, been made for the simulation of axial turns.

An optical system projected a set of lateral and longitudinal lines, representing the 6ft-square blocks of a concrete runway, on to a large screen in front of and below the pilot. A horizon was also projected on to the screen, roughly on a level with the pilot's eyes. When he raised the collective-pitch lever, simulation began and the pilot had the impression he was hovering at approximately 25ft above the runway. Fore-and-aft movement of the control column caused the whole cockpit to pitch and the lateral lines to approach or recede on the screen. Lateral stick displacement caused the longitudinal lines to move sideways across the screen in the opposite direction to the stick movement and also

ESTIMATED HOURLY COST OF OPERATING REDIFON FLIGHT SIMULATOR (TYPICAL FOUR-ENGINED AIRCRAFT)

	£ s. d.
Inspection and maintenance	5 0 0
Electric power	3 9
Periodic overhauls and spares	15 0
Heat, light, air conditioning, etc.	5 3
Senior instructor or check pilot with engineer instructor and radio aids operator	5 15 0
Direct cost/hour	11 19 0
Hourly amortization (40,000 hours in ten years—£187,500 cost = $523,125 at $2.79 (includes building accommodation and installation)	4 13 9
Simulator cost/hour	£16 12 0
or say at $2.79	$46.42

Utilization 4,000 hours per year.

initiated a sideways tilt of the cockpit towards the simulated direction of movement.

Inclination of the screen itself was so arranged that the longitudinal lines converged towards a vanishing point and thus introduced perspective into the visual picture to increase its realism.

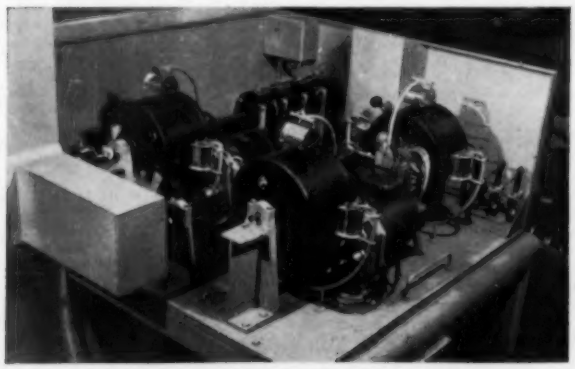
The computor of the DX.50 was electro-mechanical, of the analogue type, and had been specially designed to handle the equations of motion of helicopters. Its originality lay in the introduction of electro-mechanical double integrating units capable of giving simultaneously, and with a high degree of accuracy, output signals proportional to the values of a variable and its first derivative, in response to an input voltage proportional to the second derivative of the variable.

The characteristics of the simulated helicopters were fed into the computor by means of potentiometers controlled by dials located on the control panel. Computed solutions were given mechanically in the form of rotations to drive the optical system and govern the cockpit movements. The DX.50 could simulate the flying characteristics of a large number of single-rotor helicopters of a gross weight varying between 600 lb and 20,000 lb.

The technical data appertaining to any particular helicopter which had to be transformed into coefficients and fed into the computor were:—

- W = Gross weight (lb)
- K_x = Radius of gyration in roll (ft)
- K_y = Radius of gyration in pitch (ft)
- h = Distance between c.g. and hub (ft)
- Ω = Rotor rotational speed (rad/sec)
- $\theta_{0.7R}$ = Collective-pitch setting at 0.7 R (deg)
- λ_h = Inflow coefficient (hovering)
- β_o = Coning angle (deg)
- $2R$ = Diameter of rotor (ft)
- n = Number of blades
- I_Ψ = Rotational inertia of one blade (lb/ft/sec²)
- I_θ = Pitching inertia of one blade (lb/ft/sec²)
- I_β = Flapping inertia of one blade (lb/ft/sec²)
- W_b = Weight of one blade (lb)
- CG_b = Blade c.g. stations (% of radius and chord)
- $\frac{\alpha S}{\alpha R}$ = Ratio of swashplate movement to rotor movement (bar fixed, if any)
- $\frac{\alpha R}{\alpha SB}$ = Stability ratio = Ratio of rotor movement to bar movement (swashplate fixed)

The double integrator for the DX.50 helicopter simulator.



Aircraft	Comet 3		Typical Piston-engined Aeroplane	
Work capacity: millions of ton-miles of payload per annum	12.1		8.1	
Work capacity per £1 of first cost	15.6		14.1	
Direct operating cost:	£ per aircraft flying hour	Pence per ton-mile of payload	£ per aircraft flying hour	Pence per ton-mile of payload
Obsolescence:				
Airframe	24.5	1.4	15.8	1.4
Power plants	6.3	0.4	6.9	0.6
Insurance	13.6	0.8	10.3	0.9
	44.4	2.6	33.0	2.9
Maintenance and overhaul:				
Airframe	20.4	1.2	22.2	2.0
*Power plants	40.0	2.4	37. 5	3.3
	60.4	3.6	59.7	5.3
Fuel and oil	90.1	5.3	52.2	4.7
Cockpit crew	9.9	0.6	12.0	1.1
Landing fees	6.6	0.4	3.6	0.3
	106.6	6.3	67.8	6.1
Total direct operating cost	211.4	12.5	160.5	14.3

*The overhaul costs for turbine engine power plants are taken at 25 per cent of their first cost (maintenance costs which are small compared with the overhaul costs are also included in this figure).

The overhaul costs for piston-engine power plants and their propellers are taken at 20 per cent of their first cost.

- $\left(\frac{\alpha P}{\alpha S}\right)P$ = Ratio of stick travel to swashplate travel in pitch
- $\left(\frac{\alpha P}{\alpha S}\right)R$ = Ratio of stick travel to swashplate travel in roll
- l = Stick length
- o_m = Mean blade chord
- t_b = Time constant of bar, if any. (Time for bar to catch up to within one degree of an initial mast displacement of 10 degrees)
- γ = Lock's constant of blades
- HP_{rh} = Horsepower absorbed by rotor (hovering)

Approximately one hour for calculation was required to set up the simulator initially to the characteristics of any particular machine but further readjustment of the characteristics could be made in a few minutes.

Apart from its ability to provide ground training facilities for helicopter pilots, the DX.50 also allowed the behaviour of a prototype helicopter to be studied while the machine was still on the drawing board. With its use, the designer could easily investigate the influence of any design parameter such as blade characteristics, response lag, etc., and the test pilot could familiarize himself with the new machine's handling qualities before committing the actual machine to its first flight. It was also of value for experimenting with auxiliary devices such as automatic pilots, gyroscopic stabilizers and servo controls.

M. de Guillenchmidt went on to describe three other helicopter simulators which were under development at Giravions Dorand, the DX.80, the DX.32-C and the DX.32-B. The DX.80 was intended to simulate only one helicopter, the Sikorsky S-55, and the flight conditions capable of simulation were considerably extended by comparison with the DX.50. They included vertical take-off with control co-ordination; hovering flight; forward, backward and sideways flight; turning in hovering and forward flight; vertical and oblique climbs; and engine-failure procedure. All the flight controls were included, as was also the complete range of instruments necessary for the operation of the helicopter under visual conditions.

The DX.32-C was a simplified version of the DX.80 intended for use in primary training schools. It simulated the same flight conditions as the DX.80 but, by accepting a slightly reduced accuracy factor, the costs had been lowered appreciably.

The DX.32-B was a highly simplified hovering trainer in which the pupil sat on a pedestal with only one control, the stick. The training consisted in stabilizing a horizon bar, projected on a screen in front of him, by making the appropriate stick movements. Fore-and-aft stick movement controlled the height of the bar, while lateral movement controlled its sideways tilt. One unit was actually in operation at the Fenwick-Bell helicopter school in Paris and pupils were given a five-hour course on the simulator before beginning flying training. It was estimated that, in small-quantity production, the DX.32-B could be manufactured for rather less than £1,000, and maintenance would be negligible.

The lecturer concluded by giving an indication of the operating costs of the simulators. The figure for the simple version was £4 per hour, including depreciation. For the more elaborate trainer a figure of £7 per hour had been calculated. It had been

HELICOPTER FLIGHT SIMULATORS . .

estimated that, by giving helicopter pupils a 20-hour course on the simulator before beginning air experience, between eight and ten flying hours could be saved on the standard helicopter flying training course. Since the average cost of flying instruction was in the region of £30 per hour, a considerable saving could be effected.

THE DISCUSSION

MR. KENNETH REED (Saunders-Roe) expressed disagreement with the school of thought which saw a need for helicopter simulators. Helicopters were not difficult to fly, and it was far more effective to have a light, inexpensive, helicopter to carry out training. He did not think there was a pilot-training problem of sufficient magnitude to warrant the use of simulators. As regards their proposed use for pre-testing prototype helicopters, he thought that it might be more dangerous for a test pilot if he were to gain a false impression of a helicopter's handling characteristics before the first flight than if he were to fly the machine with no impressions at all. On the question of cost, he said that it was mandatory, by international agreement, that a student helicopter pilot should complete a certain minimum number of hours flying in the air before he was issued with the appropriate licence. The cost of the simulator would, therefore, be an added expenditure. He did think, however, that a simulator could be a most valuable asset for instrument-flying training and for gaining experience in the use of new navigational aids and procedures.

LT-CDR. P. H. FRADD (Admiralty) sympathized partially with Mr. Reed, who had expressed the view of those who felt there was no substitute for experience in the air itself. In the case of the *helicopter* simulator, though, he was inclined to be more open-minded and the Royal Navy was extremely interested in the use of such a device for training purposes. He would like to see the more elaborate simulator in use, giving the fullest possible representation of helicopter flight.

DR. G. S. HISLOP (Fairey Aviation), the chairman, asked whether the simulator could produce, satisfactorily, the exact prototype handling characteristics; and, addressing a question to Mr. Hill, he asked whether the effects of gravity and acceleration were included in the Redifon flight simulator.

MR. J. K. ZBROZEK (R.A.E.) said that if the main characteristics of a helicopter design were at fault, the error would show up on the simulator. It should be possible to improve the handling qualities of a machine before the pilots flew it. He disagreed with Mr. Reed's statement that helicopters were not difficult to fly.

MR. G. HELLINGS (Air Trainers) said he wished to endorse all the favourable comments which had been made about the helicopter simulator. He thought, however, that in its utilization to determine prototype characteristics it would do what the design office forecast the actual machine would do—and that might not be correct in practice.

MR. J. S. SHAPIRO (consultant) thought helicopters were easy to fly and considered that a simulator could make a notable contribution to the science of helicopter design by helping to determine what characteristics a pilot wanted to find in a helicopter—as a matter of fact and not of opinion.

DR. O. MEDIRATTA (Louis Newmark, Ltd.) considered the simulator was of the greatest value. It not only helped the pilot to fly a helicopter but also helped the designer to design one. He confirmed the lecturer's statement that the simulator could be of great assistance in the development of auxiliary equipment for helicopters such as automatic pilots.

MR. C. J. CARTER (M.o.S.) also supported the use of simulators, if only for the reason that, in time of a possible emergency, all available machines would be required for operational purposes and the fewer which had to be used for training, the better.

MR. H. WOOTON (Percival Aircraft) thought that simulators could well be used for crew training, as in the Redifon type, or in conjunction with pilot training where the characteristics of a particular helicopter were known. He could not, however, see any prospect of a simulator giving sufficiently accurate results for the pre-testing of a prototype helicopter when the control characteristics were not known.

MR. HILL, in reply to the discussion, said that the simulation of gravity and acceleration in the Redifon simulator was not worth doing unless it could be done really well. To achieve this, it might be necessary to adopt some form of whirling arm arrangement which would be extremely complicated and costly. He thought there soon would be a pilot training problem which the helicopter simulator would do much to alleviate.

M. DE GUILLENCHMIDT also replied to the questions which had been addressed to him. He said that a pilot training problem did exist in France and this was partly why the simulator had been developed. Whether helicopters were difficult to fly or not was a matter of opinion but certainly some of the required actions were not instinctive. These actions and co-ordination of controls could be taught to advantage in a ground simulator. It was all very well to say that a more suitable means of training would be a cheap, elementary training helicopter, but this did not exist. The use of a ground simulator could save ten hours' flying time on a training course and it would be necessary to make arrangements with the authorities as to the degree to which ground simulator time could be included in the official requirements for a helicopter licence.

He maintained that the simulator could be of value in the development of a prototype and said that pilots who had had experience of it were surprised how handling characteristics could be changed by alteration of various design parameters fed into the system. On one occasion, a pilot had noticed a change in the handling qualities of the simulator and it was found, after investigation, that an error had been made in one of the design calculations. There remained much development work to be done but simulators could make an outstanding contribution to the development of helicopters in the future.

VICTORY IN AFRICA ON TV

ENTITLED *Combined Ops*, Episode 6 of the B.B.C. Television film *War in the Air* covered the air situation in the West from early 1942 to the spring of 1943.

This was the period of Commando raids on Norway and of the Dieppe raid. A paratroop action in Norway to capture the equipment of a radar station showed several Whitley transports and a brief glimpse of Horsa gliders and a Whirlwind. This sequence included some all-too-short shots of a Heinkel He. 59 seaplane making an obviously faked, yet interesting, attack on a British submarine.

The bitter air battles fought over Dieppe while the Allied troops were pinned on the beaches were vividly portrayed and FW 190s were shown in action (this time with chronological accuracy). The "Baedeker" raids on Britain were recalled, the period being termed "one of raids and bad news."

The building up of the Air Force in Britain and the Commonwealth was conveyed by scenes from an Empire Air Training Scheme in Canada; aircraft seen included Harvard and Fleet trainers. In Britain, due credit was paid to the work of the women ferry pilots of Air Transport Auxiliary, and two sequences showed a Spitfire, Beaufort, Beaufighter and Maryland quartet, and a Kittyhawk, Hurricane and Spitfire in formation.

The organization at Gibraltar of an aircraft assembly depot was depicted, the film showing how the runway was lengthened and dispersal space made available for some 600 aircraft. (At one time 122 Hurricanes and Spitfires were assembled in nine days.) Lightnings were shown, marking the beginning of the build-up of the U.S.A. 12th Air Force.

The remainder of the film covered Operation Torch—the Allied landings in North Africa—and carried the air story on from the previous episode to the end of the Tunisian campaign. Within two days of the initial landings—on November 7th, 1942—the Luftwaffe struck back hard. Ju 88s and Me 110s were shown in action, together with camera-gun shots of both Me 110s and FW 190s being shot down.

By December, the Allied Armies were bogged down in the winter mud, along with their supporting aircraft. The Germans, holding airfields with concrete runways, were able to maintain operations and for a few weeks made fierce raids against Allied positions. Once again diving Ju 87s were seen attacking Allied troop concentrations.

In the spring the mud dried and the Allied Air Forces really got down to tactical support on a scale that made previous attempts by the Luftwaffe seem amateurish. Many shots were shown of Mitchells, Fortresses, Liberators and Bostons in action, making it easy for viewers to believe the statement that the "strength of the Air Force was the deciding factor" in the ensuing land battles.

With the end in sight the Germans withdrew most of their aircraft back into Europe, after which the pace of the Allied advance increased. There was no "Dunkirk" for the Germans and Italians; they could not achieve the essential local air superiority. Thirty-nine enemy ships attempting to take off troops were sunk in two days.

Minor blemishes in the episode included a further lack of reference to the strategic night bombing conducted during the campaign; omission to mention the contribution to the final victory made by the air operations from Malta; and the absence of any portrayal of the impressive airlift organized by the Germans to build up their forces in Tunisia after the Allied landings in North Africa. This latter operation was depicted in the earlier American film *Victory at Sea*, in the episode entitled *Sea and Sand;* with film available of the impressive fleets of Ju 52s and Me 323s used in this operation this omission from the British film is rather surprising.

M. F. A.

A. V. BELLAMY

WITH the death, on December 11th, of Mr. A. V. Bellamy, publicity manager of D. Napier and Son, Ltd., this journal has lost a one-time colleague whose friendship stood fast in changed circumstances. As a boy, in the 1920s, he lived in the building which housed *Flight's* editorial offices, and on leaving school he joined our photographic department, where he served under John Yoxall for nine years. After several years' work on various aeronautical journals, he joined Napiers in 1936. A weak heart did not deter him from pursuing the sport of sailing—a passion with him since he first owned a boat at the age of 16.

A naturally amiable personality, "Bert" will be missed not only by his old friends on *Flight*, but by those members of the industry who had dealings with him, especially at the Farnborough displays.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

The Auxiliaries and the Hunter

THE eagerly awaited "decision" about the future of the R.Aux.A.F. has now apparently been taken, but nothing seems really to have been resolved. Several points occur to me.

First, that although the new swept-wing aircraft may be almost prohibitively expensive, is it not vital to have the actual number of aircraft, so to speak, "on the scramble pan" should an attack come? Conversion during an emergency, however hurried, would probably be too late.

Second, will not history repeat itself and the piloting of these machines be no more difficult than that of their predecessors? The Anson frightened many pilots before the war at Tangmere; the Spitfire was "madly complex" and the Meteor was supposed to defy the efforts of the most skilled and intrepid part-time pilot. Yet later even raw pilots straight from the R.A.F.V.R. had no trouble in coping with the Meteor 8, and these same men now have an average of well over 200 hours on jets and fly about 120 hours in them a year—as much as a regular pilot. And one hears great things of a two-seat Hunter trainer.

Thirdly, Auxiliary ground-crews service Meteors quickly and extremely well with only a small nucleus of regular backing, and often without even that. They are keen enough (and this is the principal factor) and skilled enough to cope with the Hunter.

Fourthly, why could not the cadre squadrons be revived, so that an Auxiliary squadron would consist of one Regular and one Auxiliary flight? It would overcome the under-utilization problem by keeping the Hunters busy during the week. This the Auxiliaries (at least, in the London area) already do pretty well themselves with their Meteor 8s.

These points may not apply to all Auxiliary squadrons, but those in the London area (there are five of them) and others near the largest towns could, I feel, justify full conversion to Hunters without any trouble at all. Official timidity seems the principal characteristic of the "decision."

London, W.1. F. URIOUS.

The Smithsonian's Origin

IT was with great interest that I read the article on the air museum at the Smithsonian Institution, Washington, in *Flight* dated December 3rd, 1954.

I had seen the Wright Flyer at the Science Museum before the war, and I saw it again in its new home in 1950.

The purpose of this letter is to supply your readers with some information about the Smithsonian itself.

You will see from the enclosed photostat of the foreword to the Museum's handbook that Smithson, an Englishman who had never been to the U.S.A., donated $550,000 for the express purpose of setting up the Institution. This surely is an early form of lend-lease; and in reverse. Also, what would today's value be of $550,000 in 1829?

Liverpool, 2. HENRY T. HOUGH.

[Extracts from the foreword: "James Smithson, an Englishman who had never been in the United States, died June 27, 1829, bequeathing his fortune of $550,000 to this country to found an establishment 'for the increase and diffusion of knowledge among men,' and himself chose the title 'The Smithsonian Institution.'

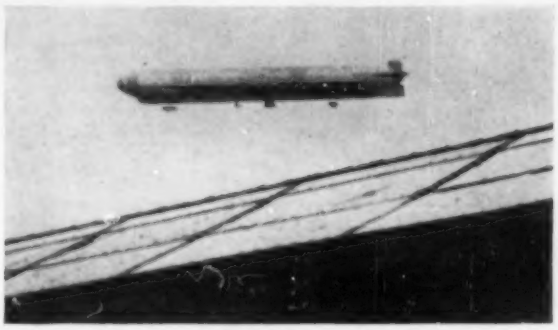
"What wealths of vision and achievement are comprehended both by the words of the gift and by the stately title that Smithson selected! The heavens, the earth, the sea, and the very air we breathe have been searched by the Institution, and their mysteries brought to light. Neither heat, nor cold, nor privations have deterred those charged with this mission of gaining and giving knowledge. Their lives are often risked in their arduous labor.

"The Smithsonian is a private foundation, under governmental guardianship, but charged with administering eight governmental bureaus. Other gifts since Smithson's have raised the original Smithsonian endowment to $3,132,000, of which, however, $1,453,000 is restricted to particular objects chosen by the donors. Yet the endowment is small compared to its opportunities for good."]

Airships as Aeroplane Carriers

I WAS very interested in the report, in your issue of December 3rd, of W/C. Cave-Brown-Cave's remarks on the subject of aeroplanes released from airships during the First World War.

When I was with No. 10 T.D.S. (D.H. 4 and D.H. 9) Squadron at Harling Road Aerodrome, Norfolk, in the latter months of 1918 we frequently saw the R.N.A.S. rigid airship L.23 flying from Pulham with a Sopwith Camel, or Pup attached below as shown in the photographs I enclose, which I took at the time.



The photograph of R.23, referred to by Mr. Cheesman.

I have never heard whether the aircraft was in fact successfully released and it would be interesting to know if any of your readers can supply more information about these experiments.

Ruislip, Middlesex. E. C. CHEESMAN.
Editor, B.E.A. Magazine.

[It is known that a Camel, with controls locked, was released from the R.23—as the same airship was more commonly known—and that it made a normal glide and a good landing. Later, with Lt. Keys as pilot, it was again released in safety.—Ed.]

Economic Boomerang?

FOR many years now you people over in U.K. have been doing things that make me wish to tack a "WAKE UP!" sign atop Nelson's Column—or the roof of the Air Ministry.

My latest "gripe" concerns the blissful and happy manner in which British gas-turbine manufacturers (and others) hand out the products of British know-how to the world at large—including some, to say the least of it, highly dubious countries. This is done without realizing or caring that although the products concerned may not boomerang against Britain in a "hot" war they will certainly provide the weapons for an economic battle.

The undeniable fact is that any nation—from Bloggsnovia down (or up!)—can, apparently without the slightest difficulty, obtain top-flight products of the British aircraft industry. These products are either used directly or else broken down with a view to home production. Whenever the latter is performed legally it has become fashionable to re-design the nuts and bolts, slap on a fancy name and label the result as a product of native genius.

In the U.S.A. many first-line military jets are using British-designed engines. It now appears today that many commercial aircraft are going to use the same engines, and I believe that the British aircraft industry as a whole will lose by it. American commercial aircraft are good, and sell well—why give them the added advantage of British turbojets and turboprops? "That's fine," your engine manufacturers will say, "but we have to eat too." That is true, but by denying non-British commercial aircraft the use of British engines, airliners throughout the world would turn to Britain for equipment and the vast increase in orders would more than compensate for the loss of engine royalties. In fact there is little doubt that such a process has already started, thanks to the Vickers Viscount.

It is therefore obvious that a tremendous potential commercial market exists for British power units throughout the world, but Britain will gain to the fullest extent only if they remain attached to the wings of British aircraft. My solution to the problem involved would be as follows:—

(a) In the interests of the defensive power of the free world Britain should continue to permit the construction, under licence, of British gas turbines in "security-cleared" countries.

(b) The use of these units or variants of these units would not be permitted in commercial aircraft without special permission. (This will not seriously affect the licensees as the bulk of aviation production for years to come will, unfortunately, be centred on military types.)

(c) Where foreign commercial aircraft are permitted to employ British units these units must be procured directly from U.K. and not from any foreign licensee. This practice would also encourage the use of British accessories abroad.

Melbourne, Australia. J. V. SIRCOM.

THE INDUSTRY

TV in Engine Flight-testing

INTERESTING applications of television in aircraft engine flight-testing are disclosed by Pye, Ltd., of Cambridge.

De Havillands have installed a television system in a test-bed aircraft for detecting any outbreak of fire in or near an engine installed in the bomb-bay. The Pye TV camera, which is pre-focused and controlled by the navigator in the cockpit, "watches" the test engine in complete darkness through a heat-resistant glass window; and as long as a small monitor on his instrument panel remains blank, the pilot knows that everything is working satisfactorily. As a double check a red light fitted to the navigator's control panel shows that the camera is continuing to function correctly.

The Bristol Company are also using Pye industrial television for research and are at present fitting it to a test-bed aircraft for engine study. The company state that the installation will necessitate some adaptation; but they hope to start operating it in a few months' time.

Heavy-duty Electrical Connections

THE cables and connectors of temporary electricity supplies, often required in aircraft factories and on airports for maintenance, emergency lighting and power and other purposes, may have to withstand rough treatment. With this in mind, the Plessey Co., Ltd., have produced a new range of heavy-duty plugs and sockets for joining electric cables.

There are four basic housings, made of forged aluminium bronze, for plugs and sockets. These are: a cable unit, for terminating and anchoring cables; a panel unit, fitted with a flange for mounting in a fixed position, wiring connections being made directly into the rear; a cable coupler, to be used in conjunction with a cable unit when it is desired to join two cables; and a panel mounting coupler, which is similar to a panel unit except that an outlet and fittings are provided to enable a cable to be connected at the rear.

The housings are arranged to accommodate either a plug or socket fitting, which are interchangeable, in any of the three standard sizes: two-way, 10 amp; four-way, 50 amp; three-way and one earth return, 50 amp.

These plugs and sockets, it is stated, are of great physical strength, will stand up to the weight of passing vehicles and are completely weatherproof. Positive contact pressure ensures good electrical continuity.

Ekco Appointments

TWO new appointments are announced by E. K. Cole, Ltd. Mr. A. J. Brunker, B.Sc. (Eng.), A.C.G.I., D.I.C., A.M.I.E.E., relinquishes his position as general export manager to become chief engineer of the company; and Mr. W. M. York, who as an executive director already controls publicity and the heating division of the company will, in addition, now direct export activities covering radio, television, plastics and ciné equipment. Mr. Brunker will be responsible to Mr. A. W. Martin, M.B.E., technical director, and will assist him in the general administration of the company's development and engineering department. Mr. Brunker retains his directorship of Ekco Electronics, Ltd., the wholly owned subsidiary of E. K. Cole, Ltd. Before joining the organization in 1947, Mr. Brunker was with the M.o.S., where he held the position of Deputy Director of Radio Production.

Mr. A. J. Brunker.

Versatile Resins

THE diverse applications of Epikote resins, developed by Shell Chemicals, were the theme of an exhibition held recently in London. These resins are now in full production for such purposes as the manufacture of corrosion- and damage-resistant paint, wire sheathing, plastic laminates, and the "potting" of electronic circuits.

Epikote, which is produced by Shell in America under the trade name "Epon", is directly comparable with the polyesters, but its chemical resistance, particularly to water, is greater. Its electrical characteristics, though much the same as those of the polyesters, do not suffer from degradation caused by water penetration. Other useful characteristics are its adhesion, resilience (fatigue strength), and abrasion resistance. These render Epikote laminates particularly useful in the aeronautical industry for radomes, plastic wing tips and drop tanks, potted electronic components, and surface coatings where resistance to synthetic lubricants, fuel, and high temperatures is required. Experiments are being carried out in the use of Epikote laminates in various gas turbines.

In America, both a Douglas DC-7 and a McDonnell F3H Demon painted with Epikote-based paint have shown high resistance to synthetic-lubricant corrosion and to airstream erosion.

Personalities at Shell Chemicals' Epikote resins exhibition (see below). Left to right: Sir Frederick Handley Page; Sir Francis Hopwood, a managing director of Shell Petroleum; Mr. R. A. Atkinson, sales manager, Shell Chemicals; Dr. Paice, manager, plastics and resins, Shell Chemicals; and Mr. G. H. W. Cullinan, gen. mgr., Shell Chemicals.

Aids to Inspection

THE word endoscope is a medical term describing a device designed for illuminating and inspecting cavities. Somewhat similar instruments are commonly used for specialized applications in engineering, not the least important of these being the interior inspection of aircraft components and structures after assembly.

A particularly comprehensive range of such instruments, made by the French firm of J. Bodson et Fils, is described in a catalogue received from their newly appointed United Kingdom agents, P. W. Allen, 253 Liverpool Road, London, N.1, who are themselves specialists in illuminated inspection equipment. The range of instruments described varies from a type 4in long by 5/32in diameter to another 23ft long by 1 3/16in diameter. Some of these instruments, it is stated, contain a most complex lens system, yet are very robust in construction and will stand up to many years of workshop use without loss of clarity or definition. The endoscopes vary in size, some containing bulbs of 3 mm diameter and others being equipped with lamps of 120 watts.

IN BRIEF

Ex-apprentices of the R.A.E., Farnborough, may be interested to learn that arrangements are in hand to hold a re-union in London next spring, at which Mr. J. F. ("Ben") Gunn will be entertained to mark his retirement from public service; he was for many years supervisor of apprentices at the R.A.E. Ex-apprentices who served under him are invited to communicate with the organizer, Mr. D. J. Colliver, at Albright (Engineers), Ltd., 125 Red Lion Road, Tolworth, Surrey, or with any member of the committee (Messrs. F. H. Pollicutt, G. J. Malin and K. S. Rawlins) in their own particular organization.

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CIVIL AVIATION

EXECUTIVE AIR-TRAVEL PLAN

RECENTLY introduced by Short Bros. and Harland, Ltd., is a scheme whereby the company's Flying Services Division undertakes to operate and maintain medium-size executive-class aircraft on behalf of other organizations. Under this plan, intended to assist those firms whose executives would benefit from the mobility and time-saving in having available a company aircraft, the firms themselves would purchase the aircraft.

Shorts will advise on the purchase, insure and maintain the aircraft, and provide the aircrew, flight planning information and all fuel. Although actual costs of operation would depend on the location of the operating base and on the annual utilization, typical costs for an aircraft based at Rochester would be as follows:—

De Havilland Dove; approximate initial cost £30,000, estimated annual cost of operation (including eight-year amortization) £16,000 (300 hours utilization), £19,500 (500 hours) and £36,000 (1,500 hours).

De Havilland Heron; approximate initial cost £50,000, estimated annual cost of operation (including eight-year amortization) £23,000 (300 hours), £28,000 (500 hours) and £53,000 (1,500 hours).

In the course of its various present activities (including Service training, ferrying and maintenance, meteorological flights and flying-club operation) the Flying Services Division of Shorts operates more than 60 aircraft from a total of five airfields.

COSSOR RADAR AT ZURICH

ON December 6th a Cossor airfield control radar Mk VI equipment came into operation at Kloten, Zurich, providing the airport with one of the most up-to-date radar supervision systems in the world. A similar installation has also been recently acquired by the Royal Dutch Air Force, and London Airport is likewise equipped.

The A.C.R. Mark VI is a 450 KW power S-band surveillance radar intended to provide short and medium range cover of an airfield and its approaches, and is designed to operate independently of any other radar or in conjunction with a precision approach radar (P.A.R.) to afford complete G.C.A. facilities. Its makers describe cancellation of permanent echoes as an important feature of this equipment, adding that at Zurich, where the Alps give heavy responses, it will play a very important part in the efficient supervision of air traffic.

TURBOPROP CONVAIRS

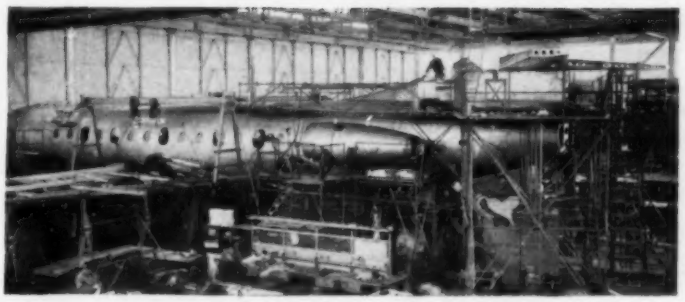
ACCORDING to *American Aviation*, Convair are giving "top priority" to a stretched version of their Model 340 Convair-Liner with four Rolls-Royce Darts. The fuselage would be 8ft longer, allowing the 340 to carry 56-60 passengers, compared with 40-44 in the existing version.

It is by no means certain, however, that Rolls-Royce would be prepared to supply their turboprops to power a potential competitor to the Viscount. Mr. J. D. Pearson, managing director of the company's aero-engine division, has said that when he accompanied Lord Hives to the United States recently American operators had tried to order large batches of Darts. Mr. Pearson added, "We have refused to sell because we wanted to give Vickers the chance to cash-in on sales of the Viscount. We have given Vickers every opportunity. We will not sell any Darts to America, but we shall reserve them for Vickers until January 1958 so that no American civil aircraft manufacturer will have a chance of competing with the Viscount."

If a turboprop Convair-Liner is to be offered (by conversion, if not in new production form), two Napier Elands would seem a more probable choice of power-plant. The Napier company has announced plans for converting a Convair 340 into an Eland test-bed. This aircraft, originally ordered for Philippine Air Lines, recently completed its delivery flight to Luton.

The *American Aviation* article stresses Napier's belief that a completely new airframe is required to take full advantage of the Eland. The following comparative data are quoted for three versions of the Convair-Liner—the existing Model 340 with two 2,400 h.p. piston engines, a version with two Eland 1s (3,000 h.p.) and another with two Eland 4s of 4,000 h.p. each.

	340	Eland 1	Eland 4
Mean cruising speed (m.p.h.) ...	255	306	335
Maximum payload (lb)	13,000	13,000	13,000
Payload on 600-mile stage (lb) ...	11,300	13,000	13,000
Payload on 1,200-mile stage (lb) ...	8,900	13,000	13,000
Payload on 1,800-mile stage (lb) ...	6,400	10,300	10,700



Jet transports in three stages—flight-test, construction (top), S.N.C.A.S.E. Caravelle (centre) and the projected and design-study—are illustrated here by the Boeing 707 Douglas DC-8, shown by an artist's impression. Strong airline interest in Boeing's protoype is reported from the U.S.A.; T.W.A. have been named as a potential customer. Here it demonstrates a phase of the ten-second retraction cycle of the hydraulically operated undercarriage. The Caravelle was photographed under construction at Toulouse a month ago; the nacelles for the two Avons were then in position on the rear fuselage. The DC-8 sketch shows that this "podded" airliner retains something of the characteristic Douglas line. If produced, it would cost some $4m.

This pleasant study of a Cessna 195 (300 h.p. Jacobs) over Bulawayo appears on a Christmas card from its operators, Commercial Air Services, Rhodesia.

CIVIL AVIATION . . .

"FLY-AND-DRIVE" PLAN

SO popular has become the combination air and automobile service started in 1952 by National Airlines for tourists to Florida that requests by passengers for use of rented cars upon arrival at their destination amounted to over 400 daily during the last winter season. Another 100 cars were added to the 750 available at the Miami International Airport.

This "Fly-and-Drive Plan" saves a tourist family or party an estimated six days and four nights of time and much of the cost of driving 2,700 miles from New York City to Miami and back in their own car. The total cost of such an automobile trip would amount to nearly $350, or $117 (£42) per person, taking running, lodging and other expenses at typical figures. By contrast, the round-trip fare per person in a "club coach" DC-6 is $96.80 (£34 11s). The one-way flight from New York International Airport is made in three and a half hours, either by day or night.

Passengers make their car-rental reservations with the airline at the point of departure (which may be any city served by the line), for the use of a late-model Ford, Plymouth or Chevrolet sedan, to be provided at the Miami or other Florida airport by Couture Car Rentals, Inc. The car charge is $29.95 (about £10 15s) per week, but it includes 150 miles of free driving. Additional mileage is charged at seven cents (about 5½d) per mile.

Rental for the car is paid by the passenger when he takes charge of it. He may rent it in Miami at a rate of $5 (£1 15s 9d) per day or $25 per week, with use charged at eight cents a mile. He may drive the car in and around the famous resort, or tour the state, at seven cents per mile; then he can turn it in to the rental company at any of fourteen Florida cities served by National Airlines, with no extra charge for this service, and return by air to the starting point of his trip. Tourists or business travellers can obtain cars maintained by rental companies in almost any city in the United States having a population of 50,000 or more, whether the city is served by National Airlines or not. The uniform rate is $25 per week, plus use-charge at eight cents a mile.

Any person, regardless of nationality, is eligible to rent and drive a car if he is in the United States legally and has a valid driving licence issued in his own country.

Florida attracts tourists in both summer and winter, for it lies between the Atlantic Ocean and the Gulf of Mexico, has an equitable climate with lots of sunshine, and is of varied scenic and historic interest. Several automobile rental agencies have co-operated with National Airlines in compiling a "Fly-and-Drive Tour Kit" which is available to tourists free of cost. It contains road maps and useful information about the most interesting areas and communities in the state, from the 700-square-mile Lake Okeechobee and the great Everglades jungle swamp in the southern part to the busy shipping and commercial Atlantic port city of Jacksonville in the extreme northern end. H.W.P.

Shown receiving congratulations from the Minister of Transport and Civil Aviation, Mr. John Boyd-Carpenter, on their award of Queen's Commendations for Valuable Services in the Air are (left to right): Mr. W. L. Bennett, Fleet Engineer Officer, B.O.A.C. Comet Fleet; Capt. P. E. Bressey, senior captain, B.E.A.; and Capt. A. S. M. Rendall, Flight Superintendent, B.O.A.C. Britannia Fleet.

"No, No, Alfa Delta —Able Love Fox Able, Dog Easy Love Tare Able."

AMERICAN AIRLINER EXCHANGE

FOR the period December 1954 to May 1955, four of Pan American's DC-6Bs are being lent to U.S. domestic airlines to increase their capacity during the busiest season of travel to Florida. Eastern Air Lines are operating two of the aircraft and the other two have been handed over to National Airlines. The DC-6Bs will be returned to P.A.A. and repainted in their colours next May for transatlantic service. In addition, Eastern and National will lease four of their aircraft to PanAm from May to October—the transatlantic peak season—next year.

BREVITIES

REQUIREMENTS as to the weights and performance of transport aircraft are summarized and explained in *Civil Information Circular* No. 161/1954.

* * *

In our introduction to the article "Airline Engineering in Canada," which appeared in last week's issue, the author, John J. Eden, was incorrectly described as a T.C.A. project engineer. This should have read "senior engineer."

* * *

Lt-Cdr. G. O. Waters is reported to be making good progress after his recent major operation and after a period of convalescence he will return to his duties as traffic director of B.E.A.

* * *

Expansion of P.I.A.'s Super Constellation services is reported from Pakistan. A new Karachi-Bombay service operating three times weekly began on December 16th and this was to be followed by the inauguration of flights to Lahore from Karachi and Dacca. A service to London is now expected to begin in mid-January.

* * *

Damage to two B.E.A. Viscounts occurred in training accidents at Blackbushe last week. On December 12th, G-ALWF suffered partial undercarriage collapse on landing; the undercarriage, flaps and starboard airscrews were damaged. The following day G-AMOB overran the runway after the captain had decided to abandon the take-off. Its undercarriage folded up and the aircraft came to rest on its belly. Damage to G-ALWF was not severe, but G-AMOB will be out of service for some months.

Japan Air Lines announced that they will open a twice-weekly service between Tokyo and Hong Kong on February 4th. The service, operated by DC-6Bs carrying 22 first-class and 21 tourist passengers, will include a stop at Okinawa.

* * *

Mr. David Millar, vice president (finance) of K.L.M., died on December 9th at the age of 61 after a prolonged illness. Mr. Millar had been with the airline for 34 years.

* * *

As part of the Sudan Government's leave scheme, Airwork, Ltd., were commissioned to fly more than 200 children to Khartoum so that they could spend the Christmas holiday with their parents.

* * *

Schiphol Airport Authorities and K.L.M. co-operated recently in giving Aldis Brothers, Ltd., facilities for demonstrating their new long-range signalling lamp to representatives of Service and civil aeronautical and marine organizations. Signals were flashed between the "V.I.P." lounge and a distant point on the airfield.

* * *

M.T.C.A. traffic statistics for August show that the United Kingdom airlines offered six per cent more capacity on their scheduled services and carried five per cent more traffic than in August 1953. Though the utilization of B.O.A.C.'s aircraft increased by 14 per cent, the Corporation carried three per cent less traffic—due largely to the withdrawal from the South American routes. B.E.A., offering 15 per cent more capacity, carried 11 per cent more traffic and the independents, whose total capacity showed a 20 per cent increase, increased their traffic by 16 per cent.

"... and this will be the Mk 4."

B.O.A.C. are increasing the frequency of their services from New York to the Caribbean. By January 28th there will be two weekly return tourist services to Nassau, Montego Bay and Kingston, five direct first-class flights to Nassau and two first-class direct services to Montego Bay.

* * *

Colombo, Ceylon, is the first eastern terminal destination, other than Sydney, to be served by B.O.A.C. Constellations. The new service, which began on December 7th, was formerly operated by Argonauts which called at Rome before flying on to Beirut; the Constellation covers the 2,100 miles between London and Beirut in a single hop and takes four hours less for the journey to Colombo.

ISLAND AIRLIFT

ONCE the haunt of Bristol Channel pirates, Lundy Island is now linked to the Devon coast by air. Several times a day in the holiday season Maurice Looker of Devonair, Ltd., flies his Lycoming-engined Auster to and from Rafton Gate Aerodrome, Braunton, carrying mail and assorted stores. The landing strip extends from the far side of the lighthouse—seen on the extreme left of the picture—slightly upwards towards the right, through the wide gap that can be seen in the stone wall and so to the far corner of the (comparatively) large field. Occasionally a shorter run at right angles has to be used. Incidentally, there still lies on the island the wreckage (mainly the Jumo 211 engines) of a Heinkel 111.

INSPIRATION UNLIMITED

Or, How to Write Travel Books Without Actually Going Anywhere

AMONG books intended for reference rather than perusal, we have an especially high regard for the *A.B.C. World Airways Guide*, one of the most remarkable examples of compressed information ever published. In common with all other "monumental words of reference," the *Guide* is useful in many ways beyond its original function—as we shall now attempt to show.

Though it costs but five shillings, it can provide writers with endless inspiration for stories of travel, adventure and romance. Its 500 closely printed pages, imaginatively interpreted, will take the creative spirit through any part of the world. Its contents are rich in atmosphere and local colour. And such gaps as occur in the narrative are easily filled in by reference to authors who have actually visited the chosen scene of action.

Having secured your copy of the *Guide* (new writers begin here), turn right away to page 2, where you will find some useful tips on how you or your characters should travel. Since no money is involved, straightforward first-class tickets might seem the obvious choice. And yet who knows what adventures await the man setting out on an Off-season Double Open-jaw Routing?

Page 22 of the *Guide* ("Currency and Exchange Values") supplies all the cash you can amass or squander on your global travels. Riyals and Quershes for distribution to the needy in Saudi Arabia, Colons (at 5.58 to the dollar) for Costa Rica, and—for journeys beyond the Iron Curtain—an ample supply of Levs, Hellers, Fillers, Zlotys and Kopeks. A word of caution: when drawing your allowance, remember that "Local Taxes . . . are imposed by some authorities" (page 20). That twelve per cent Guatemalan transport tax could add up to quite a few Quetzals over the course of a whole book.

No up-to-date book is complete without frequent references to passports, visas, frontier controls, visitors' permits and the like. All the background information you need is to be found under "International Travel Requirements" (pp. 16-18). You may decide temporarily to adopt Liechtenstein citizenship, which confers right of entry to a wide range of countries without the bother of obtaining a visa. Remember that Algerians visiting Vienna require a "grey card," and that Nicaragua denies admission to ". . . Armenians, gipsies or unaccompanied persons of more than 80 years of age." Should you decide to visit Peru, arm yourself with a certificate guaranteeing "integrity for the past 10 years."

Destinations may now be chosen by the simple process of flicking through pages 233-488, which contain a thousand timetables setting out all the world's air schedules.

Why not begin with the Far North? Here is a land rich in literary resources, awaiting discovery by a new race of adventure writers. The names of its towns and cities—Utopia, Platinum, Ruby, Granite Mine, Copper Center and Uranium City—suggest great stories of a present-day gold rush. They also suggest perils (Cripple Landing, Porcupine Creek, Black Rapids), a primitive past (Old Crow, Arctic Village), and the forces of law, on call even in the bleakness of the Arctic (Resolution, Fort Vermilion, and the Naknek Air Force Base, King Salmon).

Next we would advise a move south. Use of the *Guide* is not restricted to authors of travel books; indeed, there is a particularly appealing West Coast Airlines route (Port Angeles to Idaho Falls, Table 760) which contains the essence of a first-rate whodunit. At the centre of it all is a tough private eye named Pendleton with an assistant, McCall, and a glamorous secretary, Coeur d'Alene. Roseburg, manager of the Astoria, calls in Pendleton to investigate the murder of an Englishman, Burley-Rupert. Against Coeur d'Alene's advice, Pendleton makes a play for the beautiful Indian singer, Wenatchee, in the hope that she will lead him to the mysterious La Grande. . . .

Or would you prefer a breezy, up-to-the-minute tale of air pirates in the Caribbean? Table 863 provides the starting-point—a Goose amphibian setting off from Man-O-War Cay for Hope Town, Marsh Harbour and Sandy Point, where the captain is to pick up a sealed package for Governor's Island. Meanwhile, a fast seaplane, painted black and carrying no markings, is being launched in a secluded cove at Green Turtle Cay. . . .

New York is a must on your visiting-list. This city has clearly become the centre of some great international intrigue, as witness these constant comings and goings of *Monarchs, Paris Ambassadors, Presidents, Statesmen* and *Chicago Executives*. Perhaps these frequent meetings are held to discuss the growing threat of *El Conquistador* (Table 25), who has advanced from Buenos Aires to Love Field, Dallas, in just over a day.

"El Conquistador," you cry, "what a wonderful title for a book!" Relax: the *A.B.C. Guide* is full of titles. You have in mind the story of a fabulous French cabaret star of the nineties? Call it *The Golden Parisian* (Table 9) and the film rights are as good as sold. And though the titles offered by the *Guide* may have nothing to do with the subject of your book this—as any experienced author will tell you—may well be an asset.

Australia's airline timetables are packed with fascinating place-names—Daly Waters, Katherine, Doomadgee Mission, Julia Creek, Flinders Island, Goondiwindi, Cootamundra, Coolawanyah, Borroloola. . . . Between the lines, lightly sketched, is the saga of the powerful Downs family, whose roots lie deep in the outback—the patriarch, old Augustus Downs; his sons Gregory Downs, the hard-working station manager, and Ashburton Downs (the black sheep?); Marion Downs, Gregory's discontented wife; Eva Downs, youngest of the family; and Brunette Downs, a good girl at heart, but too friendly with the station hands for her father's liking.

From the Queensland Channel Country (Table 629F), where most of these Downs are found, it is but a few pages to the areas served by the Airline of the People's Democratic China—the faintly sinister-sounding Skoga. We leave it to the mystery writer to unravel the intricacies of Skoga's connections with Wu-Chang, *alias* Hankow, Nan-King, Su-Chow and Tai-Yuan.

R.J.B.

CHRISTMAS CROSSWORD

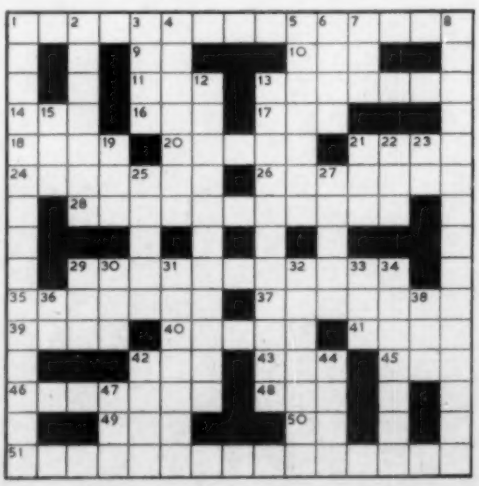
By W. T. G.

Across

1 Bandits sighted? Tell this to the fighters (9, 2, 4)
9 In Belgium, a civil exclamation (2)
10 Reversed Greek becomes a verb (3)
11 Initially prepared for the blitz (3)
13 Blast from the boss? (1, 6).
14 He flew with Kingsford Smith (3)
16 This, plus two, makes S.A.S. (3)
17 Did this de Havilland flow quietly? (3)
18 One seldom glides down a glide one (4)
20 Controlled atmosphere here? (5)
21 Speaks for the U.S. private owner (4)
24 A guided missile after you?—then you can't succeed in this (7)
26 Found in Brazil, designed in Sweden, and built in Holland (7)
28 No point on earth is beyond this (6, 5)
29 Athodyd ceases to stutter? (6, 5)
35 Of smooth-flowing, lyrical form (7)
37 Leaves at this height (4-3)
39 At the end of each transmission (4)
40 A capital where I sit in a settee (5)
41 If near the c.g. it may be large (4)
42 That the sea should not have them (3)
43 Airliners can fly with this feathered (3)
45 A mountain back to run a port (3)
46 If you are not, you should not fly (7)
48 A very poor sort of wit (3)
49 This layer is usually on the ground (3)
50 Centred upon Lake Success (2)
51 Fames tyre assets? (anag.); the result of aircraft development (3, 6, 6)

Down

1 Manufacturers would like their aircraft to be this (2, 5, 8)
2 Small, and irreversible (4-3)
3 If British, probably congested (4)
4 Multi-bank radial appellation (4-3)
5 They make light aircraft no longer (7)
6 Twin-jet ground-attack contender (4)
7 Initially trains for commissions (3)
8 Peace-time squadrons could often do with these (5, 10)
12 Every new one is "homologated" (5, 6)
13 A major modification's effect on production (1, 10)
15 Will fly Viscounts in South America (3)
19 Constituents of sulphuric acid (3)
21 U.S. counterpart of the R.Aux. A.F. (3)
22 Subject for recitation (3)
23 This ratio plus a lot can fly (2)
25 A missile booster does this (5)
27 Simple section for airframe parts (5)
29 Keep one outside the cockpit (3)
30 These aircraft closed the gap in the Battle of the Atlantic (3)
31 British Quonsets (7)
32 Heavy metal in great demand (7)
33 A permanent deflection in metal (3)
34 In the Le Touquet circuit (7)
36 A useful panel in bad weather (2)
38 May be fuel-cooled (3)
42 Accepted method of H.E. bombing (4)
44 A mighty outlet for hot gas (4)
47 Microwave frequency-band (3)



(*Solution page 918*)

"Flight" photographs

Mr. Foster inspecting the Canberra and crew from No. 540 Squadron at Wyton. Above, Air Marshal Sir Donald Hardman expresses the thanks of the R.A.F. for the American aid.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

"SPECIAL AIRCRAFT" CEREMONY

AT Wyton last week, as an expression of thanks, the Royal Air Force staged a ceremonial presentation of aircraft provided by the U.S.A. under the Special Aircraft Programme. The hangar in which the ceremony took place was decorated for the occasion in R.A.F. blue, relieved by red panels on which were badges of various squadrons.

As a background to the parade were two highly polished silver Canberras, one from No. 540 Squadron and the other from No. 82 Squadron, both based at Wyton. They flanked two equally smart Hunters in polished camouflage bearing the green and yellow chequered markings of No. 257 Squadron from Wattisham. Appropriately, the C.O. of No. 257 Squadron is Maj. Howard Tanner, a U.S.A.F. officer on exchange posting.

American representatives on the dais were: Mr. Andrew Foster, Counsellor of the Embassy; the Hon. Thomas B. Wilson, Director-General, Services Administration; Brig. Gen. Ralph I. Glasgow, Army Attaché; and Rear-Admiral R. B. Ellis, Naval Attaché. The Royal Air Force was represented by: Air Marshal Sir Donald Hardman, Air Member for Supply and Organization; Air Marshal Sir George H. Mills, A.O.C-in-C. Bomber Command; Air Marshal Sir Dermot A. Boyle, A.O.C-in-C. Fighter Command; and G/C. S. G. Wise, Station Commander at Wyton. Mr. Lincoln Gordon, Director of the American Financial Aid Mission in the United Kingdom, and Mr. George Ward, Under Secretary of State for Air, were to have attended, but both were indisposed.

There were a number of distinguished guests present at the ceremony, including A.V-M. E. C. Huddleston, A.O.C. No. 3 Group, under which the Canberras operate, and A.V-M. H. L. Patch, A.O.C., No. 11 Group, whence came the Hunters.

After Mr. Foster had inspected the parade and aircraft, Sir Donald Hardman addressed the gathering, saying that the aircraft supplied under the Special Aircraft Programme would make a due contribution to the common defence of NATO areas. Under this programme, he pointed out, 200 aircraft had already been delivered to the R.A.F. Sir Donald also reminded his listeners that, in addition, America was supplying aircraft and equipment built in the U.S.A.

Mr. Foster, replying, said that support of the R.A.F. was part of the American contribution to a common enterprise. "It is also," he continued, "tangible evidence of my country's belief in the Anglo-American relationship as the keystone of Western defence, and in the R.A.F. as a chief instrument in that scheme."

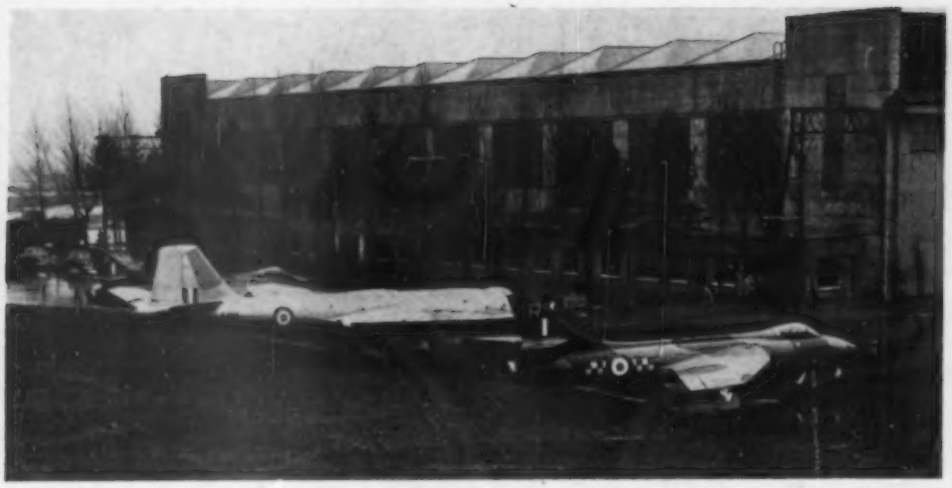
After referring to Britain's large contribution to the joint enterprise, he spoke of the Canberra and Hunter as symbols of "the engineering genius of Britain, the great power and brilliant resource of the R.A.F., and the close and enduring co-operation on which the survival of our two nations so much depends."

The Special Aircraft Programme is one of a number of aid arrangements whereby the United States provides a proportion of the cost of certain batches of aircraft ordered for the R.A.F. The present programme, related to aircraft delivered up to the end of next June, covers upwards of 350 British aircraft, including both fighters and bombers. About 70 per cent of the cost is borne by the U.S. and under the current arrangement 85 million dollars is made available. A further 35 million dollars has been authorized.

Under another aid scheme, whereby the U.S. pay for British military equipment for delivery to the R.A.F., contracts to the value of 103 million dollars have already been signed in respect of Javelins, Hunters, Sapphire turbojets and armament.

Owing to bad weather the inspection of 30 Canberras lined up on the perimeter track had to be made from inside closed cars.

"Flight" photograph



"Flight" photographs

In addition to the aircraft displayed inside the hangar at Wyton, a representative group of one Canberra and two Hunters was lined up on the tarmac for Mr. Foster to inspect.

SERVICE AVIATION . . .

Air Ministry Appointment

WITH the acting rank of air commodore, G/C. W. E. Oulton, C.B.E., D.S.O., D.F.C., has this month become Director of Operations (3). He has just completed the 1954 course at the Imperial Defence College.

A.Cdre. Oulton's career in the Service has been an exceptionally varied one. Graduating at Cranwell in 1931 he began flying duties with No. 204 (Flying Boat) Squadron in the Mediterranean, later performing administrative duties at Hal Far, Malta. Operational units in which he served during the war include No. 217 (Fighter) Squadron, No. 54 Squadron and in the Azores, No. 206 Squadron. From August 1944 to the following February he commanded Castle Archdale.

The Whittle Prize

A PRIZE which will be competed for annually by cadets of the R.A.F. Technical College, Henlow, has been presented by A.Cdre. Sir Frank Whittle. It will normally consist of suitably inscribed and specially bound books, and the first award will be made in July 1955. When offering the prize Sir Frank wrote, "a preliminary idea is that it should be for an essay on future development in aircraft design, the title I used for my Cranwell thesis which really marked the starting point of my work on the jet engine."

The subjects selected for the first competition deal with advances in radio, electrical and electronic equipment for aircraft.

R.A.F. Appointments

AMONG recent appointments announced by the Air Ministry are the following: For administrative staff duties, G/C. M. D. Crichton-Biggie, D.F.C., to No. 23 Group; G/C. C. G. Stowell, O.B.E., to Flying Training Command; W/C. J. L. Schooling to 2nd T.A.F.; W/C. J. Wood, D.F.M., to No. 90 Group; and Act. W/C. C. J. Myers to Technical Training Command. Other administrative appointments are those of W/C. J. Northrop, D.S.O., D.F.C., A.F.C., to Bruggen; and W/C. R. Scott to Bishopbriggs.

For technical staff duties, W/C. E. J. Watts, M.B.E., to F.E.A.F., and for technical duties W/C. W. P. Spinks to Hemswell; Act W/C. R. B. Cole, D.F.C., A.F.C., to West Raynham for flying duties.

Air Ministry appointments include those of G/C. E. G. M. Charleston, O.B.E., W/C. W. J. Gale and W/C. J. E. Garwood to the Department of Air Member for Supply and Organization, and Act. W/C. T. S. Kitching, D.F.C., to the Department of the Chief of the Air Staff.

"Eight-eighths cloud again."

Winners at Cranwell: Sen. U/Off. G. Wallingford, left, who won the Sword of Honour, and U/Off. B. Heywood, awarded the Queen's Medal. The reviewing officer at the graduation parade of the 63rd Entry was the First Sea Lord, Admiral of the Fleet Sir Rhoderick R. McGrigor, G.C.B., D.S.O.

Cranwell on Leave

TEN flight cadets of the R.A.F. College, Cranwell, Lincs, led by three officers, are spending a fortnight ski-ing at St. Moritz over Christmas by arrangement with the Combined Services Winter Sports Association. Another eight cadets are skiing in the Cairngorms, and one officer and five cadets are potholing in the Mendip Hills.

The ten cadets were due to leave Cranwell on a training flight by Anson aircraft last Monday, and their programme allowed for a visit to the Royal Canadian Air Force base at Solingen, in the Ruhr, before entraining for St. Moritz. They return on Monday, January 3rd, to Solingen, whence they fly home next day. The officers travelled by charter aircraft from Blackbushe to Basle. Heading them is S/L. E. H. Taylor, A.F.C., a New Zealander. The Scottish ski-ing party, by arrangement with the Scottish Council of Physical Recreation, are staying at Newtonmore, Inverness-shire.

A.T.C. Cadets Exchange

TWENTY Australian A.T.C. cadets are to be selected this month to take part in a goodwill tour of Malaya from January 3rd to 24th next year. At the same time 20 Malayan cadets will visit Australia.

R.C.A.F. Appointment

AT the conclusion of the Imperial Defence College course which he is attending, A. Cdre. L. E. Wray, O.B.E., A.F.C., C.D., will return to Canada and become A.O.C. Air Defence Command. On taking over his new post he will be promoted to the rank of air vice-marshal.

During the war A. Cdre. Wray commanded an R.C.A.F. station in Bomber Command. He was shot down while on a raid over Frankfurt and was sent to the notorious Stalag Luft III.

Reunion

THE reunion of officers of Nos. 25/29 Group headquarters and stations (war) is to be held at 1830 on Friday, February 18th, at the Bedford Head Hotel, Maiden Lane, Strand, London, W.C.2. Tickets (5s 6d) from A.V-M. E. D. Davis, Room 223, First Avenue House, London, W.C.1. All officers—R.A.F., W.R.A.F., Commonwealth and Allied—are invited to attend.

CROSSWORD (see page 916)

Across: 1 Intercept at once, 9 OO, 10 Eat, 11 A.R.P., 13 A rocket, 14 Ulm, 16 D.N.L., 17 Don, 18 Path, 20 Cabin, 21 A.O.P.A., 24 Evasion, 26 Scandia, 28 Bomber Range, 29 Evener pulse, 35 Idyllic, 37 Tree-top, 39 Over, 40 Sofia, 41 Tail, 42 A.S.R., 43 One, 45 P.L.A., 46 Insured, 48 Nil, 49 Hen, 50 U.N., 51 Yet faster masses.

Down: 1 In super priority, 2 Trim-tab, 3 Road, 4 Corn-cob, 5 Aeronca, 6 Taon, 7 O.T.C., 8 Extra aeroplanes, 12 Plane record, 13 A disruption, 15 L.A.V., 19 HSO, 21 A.N.G., 22 Ode, 23 Pi, 25 Impel, 27 Angle, 29 Eye, 30 V.L.R., 31 Nissens, 32 Uranium, 33 Set, 34 Etaples, 36 D.V., 38 Oil, 42 Area, 44 Etna, 47 u.h.f.

Flight deck of H.M.S. EAGLE, Britain's largest and latest Fleet Aircraft Carrier, taken during her spring cruise.

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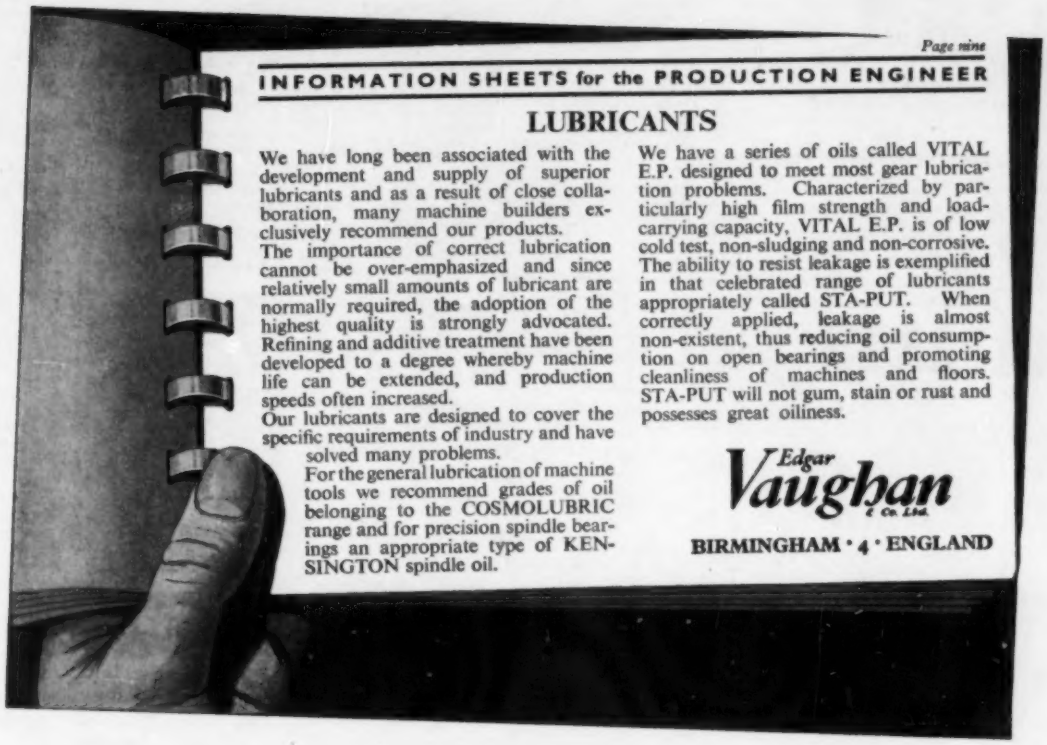

Page nine

INFORMATION SHEETS for the PRODUCTION ENGINEER

LUBRICANTS

We have long been associated with the development and supply of superior lubricants and as a result of close collaboration, many machine builders exclusively recommend our products.

The importance of correct lubrication cannot be over-emphasized and since relatively small amounts of lubricant are normally required, the adoption of the highest quality is strongly advocated. Refining and additive treatment have been developed to a degree whereby machine life can be extended, and production speeds often increased.

Our lubricants are designed to cover the specific requirements of industry and have solved many problems.

For the general lubrication of machine tools we recommend grades of oil belonging to the COSMOLUBRIC range and for precision spindle bearings an appropriate type of KENSINGTON spindle oil.

We have a series of oils called VITAL E.P. designed to meet most gear lubrication problems. Characterized by particularly high film strength and load-carrying capacity, VITAL E.P. is of low cold test, non-sludging and non-corrosive. The ability to resist leakage is exemplified in that celebrated range of lubricants appropriately called STA-PUT. When correctly applied, leakage is almost non-existent, thus reducing oil consumption on open bearings and promoting cleanliness of machines and floors. STA-PUT will not gum, stain or rust and possesses great oiliness.

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Postal Orders and cheques sent in payment for advertisements should be made payable to Iliffe & Sons, Ltd., and crossed & Co.

Trade Advertisers who use these columns regularly are allowed a discount of 5% for 13, 10% for 26 and 15% for 52 consecutive insertion orders. Full particulars will be sent on application.

Box Numbers. For the convenience of private advertisers, Box Number facilities are available at an additional charge for 2 words plus 1/- extra to defray the cost of registration and postage, which must be added to the advertisement charge. Replies should be addressed to "Box 0000, c/o Flight," Dorset House, Stamford Street, London, S.E.1.

The Publishers retain the right to refuse or withdraw advertisements at their discretion and do not accept liability for delay in publication or for clerical or printer's errors although every care is taken to avoid mistakes.

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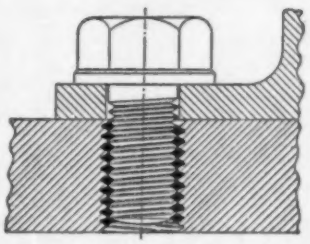

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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

FROM Lancashire Aircraft Corporation, Ltd., of 7 Berkeley Street, London, W.1:—

APPLICATION No. 432. For a Seasonal Inclusive Tour Service with Dakota aircraft in conjunction with Air-Coach, Ltd., for the carriage of passengers and supplementary freight between Blackpool (Squires Gate) and Beauvais (Tille) at a frequency of from two to four services weekly during the season from May to October each year, for a period of seven years, commencing 4th May, 1955. The Company to operate to Paris (Le Bourget) or to Le Touquet should the airport at Beauvais not be available.

APPLICATION No. 433. For a Seasonal Inclusive Tour Service with Dakota aircraft in conjunction with Air-Coach, Ltd., for the carriage of passengers and supplementary freight between Blackpool (Squires Gate) and Strasbourg (Entzheim) at a frequency of from one to two services weekly during the season from May to October each year, for a period of seven years, commencing 15th May, 1955.

APPLICATION No. 434. From Airwork, Ltd., of 15 Chesterfield Street, London, W.1, for a Colonial Coach Service with Hermes IV aircraft for the carriage of passengers and supplementary freight between London and Bermuda, Nassau-Jamaica-Barbados and Trinidad at a frequency between London and the West Indies of from one to two services weekly for a period of 10 years, commencing three months after date of approval.

APPLICATION No. 435. From Hunting-Clan Air Transport, Ltd., of 5 Fitzhardinge Street, London, W.1, for a Seasonal Inclusive Tour Service with Dakota and/or Viking aircraft in conjunction with G. M. MacDonald (Air Travel) Agency, Ltd., for the carriage of passengers between Manchester (Ringway) and Tarbes (for Lourdes) at a frequency of from one to five services weekly during the season from April to October inclusive each year for a period of seven years, commencing 1st April, 1955.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, Westminster, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections.

THE Air Transport Advisory Council also give notice that the following application has now been withdrawn:—

APPLICATION No. 394 from Dragon Airways, Ltd., of Speke Airport, Liverpool 19, for a Seasonal Vehicle Ferry Service between Liverpool (Speke) and Belfast (Nutts Corner) via the Isle of Man (Ronaldsway) with Bristol 170 aircraft, which was advertised in "The Times," "The Aeroplane" and "Flight" on Friday, 22nd October, 1954. [3044

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1. SENIOR TECHNICIAN
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